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BOOK REVIEWS

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KOREA'S NEW DEAL IN EDUCATION

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AUGUST 30, 1948 found me a member of a United States Army Educational Mission on my way to Seoul, South Korea. For ninety days, I was to help Korean teachers learn democratic procedures and secondary science methods for use in their public schools. My trip to Korea covered 11,000 miles, in seven kinds of planes and twelve lay overs or stops. Honolulu, Guam, and Tokyo were the most interesting stop overs. On arrival at Seoul, South Korea the Army housed us in three bedroom apartments for three teachers. There were four apartments to a building. Our apartment buildings were among ten in a compound built to house the United Nation's people. We had Beautyrest mattresses, Hollywood beds, large living room, a bath, and a laundry room. Our meals were at the Chosun Hotel which the Army had taken over. The finest in American food was served to us such as steaks, French fried potatoes, and ice cream with fresh strawberries.

The Army had briefed us at the Pentagon Building about our mission. After arriving at Seoul, the personnel of the American Department of Education, the Department of State, the U. S. engineers, agriculturists, transportation engineers, and experts on commerce, forestry, health, mining, fisheries and industrialists and technicians briefed us for several weeks on what they had learned about the Korean people and their problems. We were taken on a tour of city and rural schools in more than one province by the U. S. Department of Korean Education. The President and Prime Minister of South Korea, and President of Seoul National University spoke to us concerning Korea's educational problems. We also had the opportunity to meet and converse with representatives from educational institutions in Seoul, which numbered about twenty schools of higher learning. Most of these representatives spoke very fluent English.

Seoul National University loaned to the Army an old brick dormitory located on the university campus to house our U. S. school of education. Our mission was to set up a school of education patterned after those found in the United States. The Army put the building in first-class condition. They put in new floors, windows, repainted it, furnished it, and supplied books for the library, as well as all other necessary supplies. When our mission was finished we turned the key to the building and left every thing to the Koreans to use as they saw fit after our departure. We had hopes that they would want another school of education such as we had held for them. Instead of our fine school to train teachers in democratic principles, soldiers are now being trained by the strictest militaristic methods in this fine building!

The Korean Department of Education sent invitations to schools all over South Korea urging their teachers to take leaves and participate for ninety days in the school of education set up by American teachers. The Army had already sent several hundred Koreans to the University of Hawaii

and to the United States to be trained as educators. This educational mission was just a way that the Army had of reaching more Korean teachers quickly.

Approximately 350 teachers, well distributed over South Korea, enrolled in our school. There were eight women. In South Korea there are many more men than women teachers, even in the public elementary schools. Practically all the men in our school wore western attire. Most of the women wore native dress. The men students were very frank, friendly, and full of questions about my personal life, the United States, and progress in science. The women were very demure and preferred to sit together at the rear of the classroom and listen but not participate in class discussions. It was very difficult to get answers to questions directed to them. A few of the men went out of their way to see that the women were given an opportunity to share in the classwork, but the majority gave them absolutely no notice.

Our school of education was called the Teacher Training Center. The faculty came from all parts of the United States, the age range of the personnel was about 40–70 years of age, the salaries of the teachers ranged from $2,800 to $10,000, from first grade teaching positions to directors of schools of education, from teachers with one degree to teachers with several degrees, and more women than men. The Army was very shrewd in the selection of personnel for this educational mission to Korea. The Koreans prefer old teachers, men, those with many, many degrees, and especially those who have written a book. The Army had a sample of every one of these on our faculty and weighted with those the Koreans could not appreciate—unmarried women teachers. Women have very little status in institutions of learning in Korea, almost none in the professions, in fact there is almost no employment for them except in the home. Even with this lack of respect for women, the minister of commerce in the President's cabinet is a woman and South Korea has universal suffrage and the women took advantage of this privilege and voted in the general election.

The Korean students at our school of education registered and met classes as is done in any college of education in the United States. The afternoons were given to workshops. Courses in *Elementary Education, Improvement of Teacher Training, Methods in Mathematics Training, Methods in Elementary and Secondary Science Training* (the last named I taught), *Curriculum Development, Democratic Procedures, Human Development, Library, Health, Industrial Education,* and *Agricultural Education* were taught in our school. We had activities such as home rooms, student councils, and assemblies, so that these students could live what had been given to them in theory in their Democratic Procedures class. Our visual aid teaching (even though we had a wealth of material furnished by the Army) was limited because electricity was so tempermental due to most of the power plants being in North Korea. Field trips, using army buses, were taken to acquaint Korean teachers with their community and to demonstrate the value of field trips as teaching aids. Trips were made to the airport, textile mills, locomotive foundry, forestry experimental laboratory, radio station, telephone exchange, national research laboratory, and national mechanical and natural science museum. The Korean public schools have field trips, but emphasis is on recreation —a few stops may be made to places of historical interest—and it is not unusual for a school of a thousand students and their teachers to walk twenty miles in an orderly procession to have a picnic.

In the Korean colleges, (there were twenty in Seoul), the classes were crowded, because most of this generation of Koreans were exploited by the Japanese and denied the opportunity to attend school beyond the sixth grade. They were not denied schooling because of lack of power to learn, but because the Japanese did not want them

to become superior or to develop leadership. In our school we gave many of the modern tests (Dr. Yum, a Korean from the University of Chicago made the tests that we used on Koreans) and the Korean students compared favorably with the American students. The college courses were limited, because of the scarcity of teachers. The Japanese held all the teaching positions. Because of this, very few Koreans are qualified to teach. The laboratories are poorly equipped, because nothing new has been added for twenty years. The buildings are in need of repair and additional buildings are needed. There are few texts, because all the texts were in the Japanese language. Much time and many courses are offered in mathematics, because it can be taught with less equipment.

Under the United States Army Occupation ten of the twenty colleges in Seoul agreed to place themselves under one administration and one president and become Seoul National University. Before liberation, the national university was a branch of Tokyo Imperial University. In 1944 the Japanese made up only 3 per cent of the total population of Korea. They included, however, 50 per cent of all persons who had done graduate work in a university. The need is imperative to foster and extend educational facilities whereby Koreans may be able to fill the gaps left by repatriation to Japan of a relatively small but highly trained segment of the population. They need an educational system that can do without many of the authoritarian features so characteristic of Japanese education. Koreans hate everything Japanese, still their educational objectives, organization, and methods are a replica of the Japanese. The last available figures under the Japanese showed that there were 19 institutions of higher learning in South Korea. These had a staff of 261 Korean and 647 Japanese professors. There were 3,039 Korean and 3,909 Japanese students in the 19 schools. After five years of U. S. Army occupation, there are 29 higher schools of learning, 2,255 teachers and 21,250 students. Of these students, about 1,000 are women. Koreans, especially women, need to be brought to this country through scholarships, for short technical courses, medical, and engineering training. The Koreans have no facilities for training and no one trained to manage power plants, textile mills, transportation, and schools. In visiting the national research laboratories, we found much valuable scientific equipment not in use, because there was no one in Korea who knew how to use the equipment. The Japanese had control of these machines. The Koreans had some of the laboratory under control because they were trying to carbonize low grade coal, to make rayon more elastic, to make better dyes, and to make a better, cheap ceramic.

In secondary education, the middle schools consisted of grades 7–12. Most of the city schools are large concrete structures housing two to three thousand students. During the Japanese occupation there were 252 middle schools in South Korea enrolling 31,891 Japanese and 62,136 Korean students. The Japanese population was 4 per cent of the total, yet they made up 33 per cent of those enrolled in middle schools. Only 833, in a total of 3,603 teachers were Korean. It was in the field of secondary education that the Japanese concentrated on their system of thought control. Today there are 423 middle schools, 8,238 teachers (all Korean) and 226,960 students. Teachers are scarce, texts difficult to get, not enough buildings, and all buildings need to be painted and repaired. Admission of students had to be made on competitive examination. Too often it was on the ability to pay since schools are largely financed through "forced contributions" from the parents. Only 16 per cent of the eligible middle school students can be in school. Korea needs four times as many middle schools and three and one-half times as many teachers. This is unfortunate because the children are eager and hungry for schooling. It was deplorable and revealing

to see children and adults starved not for physical food but mental food. The libraries and book shops were full of avid readers. People stand or sit on the floor in book shops and read as our youngsters do the comic book at the corner drug store, and make no purchases. Every scrap of printed paper is read and re-read as one loiters on the street corners. No school day is too long or lesson too hard. The parks and museums had been denied the Koreans. Now, the Korean crowds them for mechanical information and sights of beautiful objects. The Korean youth is eager to excel in sports. They have a fine stadium at Seoul, separate fields and bleachers for baseball, soccer, tennis, track, and swimming. There is continuous training for the Marathon and the goal is the Korean Olympic team. Every day there can be seen track teams running down streets or country roads. On weekends they run from town to town. Nearly every yard boasts parallel bars. The Koreans have often excelled at sports, but the Japanese are said to have taken the credit. All Korea loves baseball. They wept on the street when Babe Ruth died. They would stand on the street to read bulletins put out about Ruth's illness.

The Korean National Department of Education exercises fairly rigid control over secondary schools. The U. S. Army encouraged decentralization and local initiative. In the new curriculum, students are offered some elective courses. New subjects like forestry, sericulture, fisheries, electrical engineering, commerce, and stock breeding have been put into the curriculum. There is little provision for relating education to the current problems of the community or nation. There is practically no experience given in vocational or practical arts. There is no evidence of a guidance program. The middle schools have no co-education. Korean teachers know only the highly formalized methods of Japanese teaching. There is little give and take between teacher and pupil. The formality and rigid discipline of cold, austere teachers found in some of the Korean public schools is quite nauseating.

In elementary education the Japanese had 1,542,645 Korean children between the ages of 6 and 12 out of 3,500,000 enrolled in school. There were 13,782 elementary teachers and 8,650 of these were Japanese. The U. S. Army had 34,757 Korean teachers. It has been a tremendous job to secure and train 21,000 teachers. Many or most are inadequately trained. Sixteen workshops for 7,500 teachers were held in one summer, which emphasized principles and practices of democratic education. Elementary schools have increased from 2,694 to 34,039 with practically no new buildings. Double sessions are used in practically all the schools. School uniforms are worn in all elementary and secondary schools. Co-education is found in a few first grades, but in no other grades of the schools. There are no hot lunch programs. Where children bring lunches, they consist of cold boiled, sticky rice, a fish head, and kimchi (a kraut made of Chinese cabbage and red peppers). The Parent Teacher Associations, where they exist, are for the express purpose of getting revenue for the operation of the schools. The school's prosperity depends on the thrift and initiative of the parents. The elementary schools in cities have two to three thousand students. They are large, flat-roofed concrete structures. The students play on the roof as well as on the grounds. The playground is ample and well equipped with swings, see-saws, large jungle-gyms, rings, acting and parallel bars. Japanese believed in physical education and so do Koreans. The children spin tops, play hop scotch, and jump the rope on the school yard. There is a time for formal calisthenics during the school day—no more than five to ten minutes of the day is used for drill. There was superb folk dancing on the roof, dirt school yard, or indoor gym floor.

An elementary school near the Seoul

National University campus was used as a demonstration school for our students in the American Training Center. One of our U. S. teachers remained in this building practically the whole ninety day period working with the staff of this school and the teachers in our school of education. This teacher saw marked improvement in the democratic procedures. The principal had faculty meetings and even invited the women teachers to the last one. Class size in this school averaged about 80 students. When I had a free moment I visited a first grade classroom in this demonstration school. It was interesting and pleasant to watch this teacher at work. It was her first year to teach. She was 18 years of age, less than five feet tall (most Koreans average five feet in height). She wore the native costume of full silk skirt brilliantly colored, and pastel colored short bolera blouse. The shoes worn in the school room were tennis shoes. Her hair was straight, black, with center part, and bun on nape of neck. She was quite pretty and most vivacious. It was very evident that she loved teaching and her pupils loved her. She had no college training. She was doing a better job than an older and more academically qualified teacher in another first grade room in the same building. There was a small blackboard in the front of the room, much too high for the teacher. I reminesced on the wealth of board space and the height of it in some of our American schools. The two-seated desks were pushed to the back of the room. The 83 little boys and girls were sitting in their chairs or on the back of their chairs grouped around the teacher who sometimes sat on a straight chair or stood on a teacher's platform in the front of the room. There were windows to the left and windows to the right, these last opened into a wide hall lined with windows opposite those in the school room. This double row of glass warmed the room when the sun shown. This was the only means of heat—no other provision had been made.

TYPICAL KOREAN FAMILY

Weather is sometimes zero outdoors. Some children had visible sores, many had runny noses, and some were not clean. The school had a nurse. All seemed happy and well fed. I was never conscious of hungry children while I was in Korea. The U. S. Army has grown a fine rice crop for the Koreans. Some American teacher had given this Korean first grade teacher a lovely, large copy, with colored illustrations, of *The Story About Ping* by Flack and Wiese. The teacher held the book in front of her and as she turned the pages she would ask the children what the picture said and then she would tell them what the author said. These children were familiar with ducks and like most children liked them very much. One little boy in the class had a low, coarse voice and wanted to do all the reciting. I marvelled because the attention of the class was nearly perfect. Some had to be coaxed to contribute

to the lesson and some talked without permission. It was not a dull, formal class, but very American, I felt. When the picture of *Ping* was shown under the basket, one child said that he was just thinking, another that he had just been spanked because he was late coming home from school. Some of these children walk six to ten miles to school. Koreans are a nation of walking people. Means of fast transportation is so inadequate. When the teacher finished, she asked who wanted to tell the story. Hands went up all over the room and some shouted. The teacher asked a child that did not volunteer. He had to be coaxed before he would raise his head and be willing. The teacher came down and helped the child to the platform and gave the story book to him. This little boy was a ditto of the teacher. He even stood and sat at the pages in the story where the teacher had. He was a very charming child. We had paper and crayons to supply this school; so the teacher let the children do some original drawings of the story. The drawings of Ping were excellent—equally as fine as we find in our school after a full year's work.

In visiting a large boy's school of 3,000 enrollment, we found in the general science class, boys grouped around tables studying the pendulum. Some had the duty of timing the pendulum, some were taking notes, and some were changing the position of the bobs. There were ten tables in the room and about eight boys at a table.

In visiting a girl's school of about 900 students, I visited a biology class, where the students wer making a study of leaves. Each child had brought in her own collection. Texts had the leaf illustrations, showing simple or compound leaves and the margins of different leaves and there were questions in the text to be answered. There were 46 in the class sitting at old fashioned, screwed down desks and seats in rows. In another classroom in the same building there were eight tables and six girls at a table studying electroplating. At each tabic there were the materials for setting up an experiment to copperplate. Teachers in both science classes in the girl's school were men. In another class they were studying the telegraph. The teaching was quite poor. The teacher, a man, was explaining the set-up but it could not be seen by all the class. His explanation was not simple. He was lost and so was the class.

I took my Korean teachers to visit a boy's school of 2,800 students. It seems to me that they have very few if any small schools in Korea. I did not see them. In the physics room there was a science club of 25 boys meeting after school. No instructor or sponsor was present. A student was presiding and giving out difficult math problems and the boys were competing in speed and ability for correct answers. This was fun to a Korean student. The physics storeroom was jammed with equipment that was up to date about twenty years ago. The chemistry department lacked everything, but had an excellent, young, well qualified teacher. There was a good hood, where several students could work at one time. A number of boys were working after school on a chemistry program. A biology room was lined with an ancient collection of preserved specimens of all the species of fish in Korea. The other biology room was full of an ancient collection of mounted insects and mammals. The halls were full of mounted birds. The students were working on very detailed drawings of fish dissections. The drawings were inked and colored. The biology club had a herbarium of plants collected from one mountain in the city of Seoul. The plants were nicely pressed, mounted, and labelled. It was interesting to see many of the same genera that we have, and three trees so common in Seoul such as: Acer Pseudo-Sieboldianum, Zelkowa Serrata, and Ginkgo that we do not grow so easily in Arkansas. Chrysanthemum lavender was the most common blooming native herb while I was there. Yellow clumps of it were to be seen everywhere. The

KOREAN CHILDREN AT PLAY

campus of this boy's public school was beautifully landscaped and all the trees and shrubs were noticeably labelled with scientific and common names. Down the hall from the science department, I heard singing. I stepped into a room of 100 boys practicing *The Hallelujah Chorus* without any sponsor or instructor. The boy director had made an invention concerning radio which a military person had sent to a U. S. engineer. It tickled the boys very much because I shook hands with the director, when I said good-bye. Throughout all the schools, only the upper twenty percent are in school and these are so eager for learning that self-teaching is very well done. When the teachers are ill or away from school, the children take over. In every school there is a large teacher's room. It is usually the only heated spot in the building. The teachers have many free periods during a week. They each have a desk in the teacher's room and this is where they grade papers and made preparation for class teaching. Even though there are teachers in the teacher's room they do not substitute for another teacher. The children do the substitute teaching. A chemistry teacher doesn't teach anything else. He doesn't teach biology, math, general science, and coach. His specialty is chemistry and he stays with his field. I hope the Korean teachers never give up their free periods and never fall into the error that they can teach any subject for which a principal needs a teacher.

It was my desire to get into a public school without having to go to the principal's office. I never succeeded in this. When visiting a school, the visitor was taken to the principal's office and seated in soft, easy chairs around a table. Apples and rice water

were served. I always had a sneaking feeling that the teachers and the pupils were being informed that a visitor was in the building. We were usualy given cloth bags to slip over our shoes. All school floors are beautifuly kept. Children rub on them during recess. After visiting the school, you assemble again in the principal's office and he usually asks a great many very pertinent questions as to how he can improve his school.

In a small rural school it was interesting to see the man instructor pumping an organ with his bare feet and directing the children in a Stephen Foster song for us. The English class was reading a story about a house in England. I was amused to hear them translate the word scullery and back garden. Most schools teach English beginning at the ninth grade—a few begin English in the first grade. The students speak English well. On the street, one seven year old told me in very clear English that, "he would take me to the 'top shop.'" I was amazed at the dexterity of the primary children using ink stones and brushes and making their Korean characters on old *Stars and Stripes*. The Korean alphabet has one less character than ours. The Korean alphabet can be learned in one evening and one can speak Korean in eight weeks. These children did not spill their ink or blur their papers. The professor (a man) went from child to child giving assistance. They worked at long tables. Immediately after lunch, they had their five minutes of formal drill. It was remarkable to see, because they reacted like one person.

What did we do in the Teacher Training Center to help Korean public school teachers? It is best answered by saying that our first goal was to get the Korean teachers, ranging in age from 25–45 years of age, to quit bowing to us as we entered the classroom. This was averted to some degree by being in the room and busy when classes began to assemble. We visited together before time for class. We worked on making equipment and charts to use in our classes. Most of our time was spent with general science and biology teaching, because few schools offer chemistry or physics, except as reading courses. It was most difficult to keep the class directed away from formal lecture and to emphasize class discussion and pupil participation. The teachers did not want methods, but rather formal lectures presenting to them the new discoveries in the scientific world. They more or less rebelled at using democratic procedures. The teachers felt keenly their lack of up to date scientific information more so than their lack of new methods in teaching. I could appreciate this feeling. Their students were eager for learning and adept. Teachers do not have to be full of tricks to make learning attractive to such pupils. Our students wanted new facts from the American teacher and we wanted them to question and think for themselves. They have few students who are bored even in large, ugly, overcrowded, dirty rooms where formal lectures are the usual procedure. There is practically no pupil activity. Often there are no books, paper, or pencils. Yet they have no discipline problems. We wanted to help the Korean student teacher to improve his classroom environment, to use wisely the human and natural resources of Korea, to learn how to secure aids for his teaching from things available, to realize the need for continuous curriculum revision, to understand how human beings grow and develop, and last but most important to respect the worth of the individual. The Korean teacher was starved for book learning and it was almost impossible to get the Korean students to assume responsibility for their part in the learning activity.

Yes, the U. S. Army has dealt a new hand educationally to South Korea. It will be interesting to see what the future holds for this interesting country, so eager to learn.

EDUCATION IN AMERICAN SAMOA

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ABOUT fourteen degrees south of the equator, just this side of the International Date line and 2200 miles south of the Hawaiian islands lies a tiny group of five islands. This group constitutes American Samoa. Tutuila, the largest and principal island, is 18 miles long, only six miles across at its widest point, and has a total area of 40 square miles. On this island, with Pago Pago Bay, the finest natural harbor in the South Pacific, is situated the United States Naval Station. The islands are of volcanic origin, and the precipitous coast line is interrupted here and there by very narrow beaches. The climate is typically tropical with an average yearly rainfall of nearly 200 inches. The deeply weathered ravines and valleys that slope sharply toward the ocean are fertile and tropical fruits, plants, and flowers grow without any attempt at cultivation. The coconut tree, there, as elsewhere in the Pacific, furnishes material for food, drink, shelter, and manual industry.

There are no factories on the islands, but copra and Samoan handcrafts are exported to Hawaii and San Francisco. American Samoa is truly the untrampled garden spot of the South Pacific.

The population is estimated as more than 17,000 of which 11,000 live on the main island. Few non-Samoans live there. Of the several hundred who do, nearly all are attached to the Naval Station. Samoans are Polynesians and constitute the second largest group, exceeded only by the Hawaiians.

By presidential decree American Samoa has been administered by the United States Navy since 1900. Inasmuch as the chief interests of the Navy have been to keep a naval operating base in this region of the Pacific for its ships, the Navy has followed a rather rigid and consistent policy of maintaining Samoa for Samoans. Only those with 75 per cent or more Samoan blood can have title to the limited land area. External exploitation through visiting persons has been discouraged by the Navy. The Governor of American Samoa is appointed by the President of the United States. He is also a high ranking naval officer who acts as the Commandant of the Naval Station. Most naval officers assigned there serve a dual capacity. Thus, the senior medical officer of the Naval Station is also the Public Health Officer for the Government of American Samoa; the Public Works Officer is also the chief Civil Engineer; the Supply Officer serves as the treasurer and financial officer; the legal officer is Attorney General for the government. Plans to transfer the administration of American Samoa from the Navy Department to the Department of the Interior with a civilian administrator are currently being put into effect.

The islands are subdivided for purposes of administration into districts and the districts into counties. Each county embraces at least one village. The village council appoints a village chief who is responsible for good order of the village. He reports to the district governor on the conduct, the sanitary situation, the condition of the roads and other matters which concern his village. The chiefs constitute a hierarchy of power and although they exercise considerable influence the selection of the chief is not entirely a matter of heredity.

The Samoans are cheerful, sociable, easy-going, fun-loving, and religious. They like to dance and sing. Their dancing is individualistic and less sensuous than their Hawaiian kinsfolk but often more graceful. Their singing is communal and harmonious. Visiting one another, or village groups visiting other village groups with the attendant celebration and feasting, is the center of their activity. They exhibit

remarkable showmanship. The ingenuity and realism with which they dramatize biblical stories at Christmas- and Eastertimes is a revelation to those privileged to see them.

The Governor is the Executive Head of the Public School System. He appoints an officer on his staff to act as the Director of Education. In the past, this duty fell to the Navy chaplain stationed there but since the war the navy has recognized the need of specialized knowledge required to administer a school system the size of American Samoa and has sent officers who were especially qualified. The administration of the public school system is vested by the Code of Laws of American Samoa in a Board of Education. This board is composed of eight members, five of whom are ex-officio as follows:

Director of Education, President of the Board
Attorney General, Legal Officer
Public Health Officer, Medical Corps Officer
Public Works Officer, Civil Engineer Corps Officer
Chief Justice (a high salaried American Civil jurist)

The remaining three members must be native Samoans, one selected from each of the three districts into which American Samoa is divided. It is considered worthwhile to point out that not every school district in this country is fortunate enough to have a school board consisting of such an equitable array of professional background.

The Code further permits the employment of a Superintendent of Education who shall be a professional educator and an assistant superintendent who shall be a native Samoan. The Code further establishes a public school system compulsory for children of seven to fifteen years of age. Private and Faifeau (indigenous religious) schools are also authorized under the supervision of the Department of Education with religious freedom guaranteed in all.

The public school system is financed by the Samoan government which derives its income from a head tax, import tax, and similar revenue. The Barstow Foundation of Honolulu contributes approximately $7000 annually. The authorized budget for the public school system for 1947 was $51,025. This does not include salaries of the naval officers which are paid, of course, by the Navy. Nor does it include figures for the approved private schools which are supported by the various denominations. For 1947 the grand total expended for education was $76,000.

In the islands there are forty elementary schools, three junior high schools, and one high school. There are seven private schools supported by their respective churches. In 1948 there were 136 teachers of whom 118 were Samoans. Male teachers predominated, 106 to 30. There were 3200 pupils in the public schools and another 920 in the private schools. The highest paid Samoan teacher received $84 per month for ten months, the lowest $36. The Samoan assistant superintendent's salary is $1080 per year. On the basis of peacetime salary schedules these salaries are not out of line with the economy of the islands.

Samoan teachers are highly regarded. It is not uncommon that a village will insist that the teacher assigned to it live in that village and participate in their council.

Each village in which an elementary school is authorized is required to maintain its school and the surrounding grounds in good condition. Villages vie with each other in keeping their school fale in order. A majority of the elementary schools are typical Samoan fales. A Samoan fale is ideally suited to the climate. It consists of native tree trunks arranged in an upright position at intervals of four feet, forming an oval space approximately 30 to 40 feet along the major axis. The high pitched roof is constructed with wood stringers and light slats placed at right angles at intervals. On this frame is fastened the thatching made of coconut fronds. The floor is level with sand and gravel upon which is

placed layers of pure white pebbles. In inclement weather wide woven strips of matting arranged to fold as venetian blinds are lowered between the upright poles. This is a typical Samoan elementary school. Each child brings his small handmade mat on which he sits on the floor, cross-legged, in class.

The government pays the salary of the teacher, furnishes blackboards, teacher's locker, American flag and wherever possible other school furniture. Pupils buy their own school supplies including their mimeographed textbooks which are sold at cost. The district junior high schools and the high school are entirely government supported.

Few Samoans ever leave their island group. Their entire life is spent leisurely among the abundant growth of tropical flora. The state of agricultural cultivation is indicated by the fact that but one implement is used—a pointed stick. With this implement a hole is simply and quickly punched in the earth and a seed or cutting inserted. No attempt is even made to pack the earth. Heavy rain within a few hours does this for them while the climate accomplishes the rest. This latter fact was very forcefully and embarrassingly impressed on me. Having engaged a group of high school boys to plant a hedge about my house, I was very perturbed upon my return that they had merely placed the cuttings in holes in the ground. I called the high school principal and requested that the boys return and do the job correctly. Ere I hung up the telephone a torrential rain fell. Thirty minutes later when the somewhat surprised boys arrived the cuttings were solidly packed in the ground and I had nothing further to say.

In the village elementary schools English, arithmetic, reading, spelling, writing, geography, Samoan crafts, music, and the theme are taught. The theme is the key subject about which the other subjects are developed. Each school grade has a particular theme, as follows:

First grade—Homes and Home Life
Second grade—Community Life
Third grade—Foods and How They Are Secured
Fourth grade—Clothing and Shelter
Fifth grade—Transportation
Sixth grade—Communication
Seventh grade—Polynesian Environment
Eighth grade—Government
Ninth grade—Nations as Neighbors

Many of the mimeographed pamphlets used in the theme were badly in need of complete revision. An attempt to get this started following the reorganization after the war was initiated while I served as Director of Education. Possibly this job has been completed by this date.

The scholastic standards of the schools are not comparable with state side schools. The low standards are largely due to the meager training and preparation of the native teachers. The teaching process is largely a matter of memorization from textbooks because of the very limited experiences of the teachers who have themselves learned from the same books. Attempts are made to increase the education of the teachers through summer Teachers Institutes. The introduction of Saturday Morning Teachers Institutes throughout the year also helped to improve the background as well as to furnish opportunity for professional esprit de corps. The American teachers and naval personnel taught classes at these Saturday morning institutes.

I remember making a routine inspection trip with my interpreter to a village elementary school. We arrived just as a so-called sixth grade class was having a lesson in geography. Although we usually announced our coming for a visit to every school, it was quite evident that the teacher was nervous and self-conscious. It was apparent that he did not want to proceed with the lesson while my Samoan interpreter and I were there. To ease the situation I decided to give the children what I thought was a rather simple problem to work out. I suggested that they draw for

me on a sheet of tablet paper the outline of the island of Tutuila and to place a cross on the map to show where their village was located. There were fifteen pupils in the class but not one could draw what might be considered a close resemblance of the island, while some pupils placed a cross in the ocean! It is interesting to relate that in most papers the distorted map of the island was enclosed in a beautifully decorative designed border.

There is much evidence that the text material has been written about the outside world with little reference to the needs of the immediate environment of the Samoan children. Possibly it is fortunate that the material is so poorly taught that the Samoans have not become unhappy in their limited world.

Their lives have been sheltered ever since the Navy took over control. This is attested to by the fact that the population of American Samoa has increased from about 5500 when the Navy took over to the present figure of 17,000. This three-fold increase in about a half a century is due to the improved medical care, sanitary conditions and the suppression of warfare between the clans and villages and not to the marines and sailors stationed there although this has added a few.

The navy families stationed in Samoa employ one or more Samoan girls or boys to run the house. They are capable of handling the entire job and they like to do it. The ambition of most Samoan young men is to become a member of the Fita-Fita guard, Uncle Sam's so-called barefoot navy, consisting of approximately 200 native Samoans in distinctive tropical uniform, including a twenty-piece Samoan band under an American Navy Chief Petty Officer. These members of the guard are classed as enlisted men of the regular navy and receive pay accordingly.

The Samoans' understanding of governmental affairs is rather primitive. I remember the Annual Fono, General Native Council, meeting with the Governor and his staff to discuss the need for a road. This road would have required the blasting into the volcanic rock at terrific expense. The Samoan chiefs presented excellent reasons for the road. But when the governor inquired where and how the money was to be obtained, that stopped them temporarily. They hadn't thought of that. A quick conference takes place when such a situation arises and one member will make the proposal arrived at by all chiefs present. It was suggested that the tax on cigarettes be increased a few pennies a pack. Just a simple computation indicated to the governor that this would require everybody to smoke a dozen packs a day for twenty years. When this was turned down another huddle produced the proposal that the Navy contact the American Red Cross and on behalf of the Samoans request this benevolent society to donate the half a million dollars needed. This was made in full sincerity and only the outstanding talking chief, Tuiososoppa, recognized how naïve this suggestion was.

Change in American Samoa is slow. There is no particular urge for change. Things come easily. There is no set time for meals. Consequently there is little urge to improve oneself with the exception that every boy hopes some day to become the head of his family and perhaps the chief of the village.

As pointed out before, the educational level is not comparable grade for grade with our American school system. Nor need it be. In fact, there is much to be stated for the slower rate of upgrading of the teachers and the pupils. They are happy with few cares beyond the occasional tropical hurricanes. The naval administration has done a fine job with respect to Samoan well being. It is the tendency for all new comers of responsibility to embark on a program of accelerated upgrading. There is the urge to bring education and training to the Samoans. This is noble and to be desired but always in measured amounts. But careful consideration must be given to the consequences of changing too quickly the mode of life through ambitious and

elaborate plans of education and training. The economic condition of the island must keep up with the upgrading if the happiness of the people is to be maintained. There are no natural resources on the island. There is always danger in inducing social and educational changes without also making comparable economic changes. As Director of Education and, indeed, as everybody else who first comes to the islands, I had eager plans as to what ought to be done to improve the educational system. I soon realized the danger and shelved my plans and proceeded with caution.

But changes do take place. Years ago the Samoans made their own fish hooks from mollusk shells by laborious hand work. These hooks were fragile and broke frequently. The story is told of how a well-known anthropologist some years ago was making a study of Samoan culture under the sponsorship of a foundation supported by one of our world famous Mail Order houses. It is related that the anthropologist recommended that the Samoan chiefs emphasize their handcraft such as the practice of making hand made fish hooks. Without knowing the sponsor of the study, one chief is said to have remarked that the shell fish hooks were much too easily broken and that it was much cheaper and much more simple to get the metallic hooks by mail from ..... and ..... company!

HOW IS IT DONE IN AMERICA? *

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OFTENTIMES we live so closely to people, institutions or processes that we fail to recognize their true character. We fail to comprehend fully their weaknesses and strengths. Frequently, this is true of what we call our democratic way of life—of the commonly accepted way of doing things in America. We were born into these patterns of living, grew up in them, and, more or less unconsciously, developed characteristic attitudes and beliefs which direct our behavior. Only infrequently is the average individual ever really challenged to question the origin of these ways of doing things, the nature of their development and their ultimate goals. Most of us have become so identified with what we call the American way, have become such an integral part of it, that it is increasingly difficult to view the process objectively.

We had all heard statements such as these many times before. We had been taught in school that it was important to understand the basis of our democratic way of life. We had been told that such an understanding was essential to intelligent participation.

Some of us failed to realize fully just what all this meant until we were separated from it, and were placed into situations where the manner of living was completely different. It must be admitted that many of us were quite naïve regarding the ways of living that were different from our own. Some of us found that we were not too definite regarding the true nature of our own way of life, which we so glibly call a democracy. It was in a situation such as this that I found myself, along with many other Americans, when we landed in Japan just about five years ago.

When the American forces entered Japan, both the Americans and Japanese were amazed at what they experienced. The Americans were surprised to find that the Japanese people were not fiends but, for the most part, a pathetic people who had been misguided by their militaristic leaders. The effectiveness of earlier programs of

* Presented at the commencement exercises at Colorado State College of Education, Greeley, Colorado, Summer Session, 1946. Dr. Barnard served a year in Japan on the CI and E staff of SCAP, as officer in charge of teacher education.

propaganda were evident among both the Americans and Japanese. The tragedies of Nagasaki and Hiroshima had also conditioned the thinking of the Japanese toward the humanity of the Americans. They were afraid of these barbarians, who bombed their homes and killed their loved ones. Many of them, especially the women and children, had left the cities and had fled to the hills of the back country to await the outcome of the initial phases of the occupation. When the anticipated treacheries of these foreign invaders did not occur, they slowly returned to their homes. There they observed the event, which they had been told could never happen to Japan—the occupation of her sacred land by foreigners.

After they had overcome the early shocks of realizing that they were actually a defeated people, they began to marvel at the things which seemed to be accountable for their defeat. They were impressed with our mechanized equipment and our mountains of apparently unlimited supplies. Many of these people had never seen an American. The physical stature of our boys compared to their own was something which they found difficult to understand. Compared to their diet of rice and fish, the rations which we ate, both in quantity and variety, were the foods of supermen. Our warm, durable clothing was a striking contrast to their flimsy make-shift garments. The childish lightheartedness of the American boys on certain occasions, as contrasted with their effective demonstration of discipline and technical ability on still other occasions, was a paradox in human behavior which was beyond Japanese comprehension. Finally, the considerate manner in which our troops treated the Japanese, both young and old, was not characteristic of the way in which these people expected to be dealt with by their conquerors.

For a number of years, the Japanese had been taught in their schools that the American way of living was soft—had no purpose—and was resulting in the production of a degenerate nation of people. They were further led to believe that the Japanese people, their way of living and everything produced by Japan was superior to that of America.

The unbelievable had happened. They were observing, first hand, the material and human products of such a decadent nation. To say they were amazed is an understatement—they were completely overcome. As one Japanese told me, it was as though he were observing a dream-world descending upon him. Another remarked about the foolishness of their military leaders in assuming that they could hold out against such strength, let alone defeat such a powerful nation.

After a while, their excited interest in the American parade of personnel, supplies and equipment became a more serious concern about how all these things came to be. Many of them began asking questions about the country which had produced these marvels. They had already begun to recognize that there must be fundamental differences between America and their own country which accounted for these striking contrasts. There was one basic question for which they sought answers, "How do you do it in America?" Children as well as adults would ask: "What do people in America eat to make them so big?" "Does everyone in America own an automobile?" "What kind of clothing do the people in America wear?" "What kind of houses do they live in?" "How rich is the average American?" "What do Americans like best?" Teachers would ask: "What kind of a school system do you have in America?" "How do you teach science in America to develop such technically resourceful individuals?" "How do you teach morals and ethics in America to develop the kindliness and consideration for others which your boys have demonstrated?" "What methods of teaching are used to develop such adaptable young men?" "How much education does the average American receive?" "How do you support such an expensive educational program?" "How do you provide schools for all the people?" "How can you

practice coeducation without lowering the scholastic standards of schools?" "What is the social economic status of teachers in America?" "What have teachers in America done to improve their welfare?"

These and many other questions like them were not too difficult to answer. It was not difficult to tell them what we ate; the importance that we put upon a balanced diet; nor to describe our system of free public schools. We did not experience great difficulty in describing the best practices in teaching science and social studies, which we hoped had been accountable for the kind of product they were observing in our young men. Our explanation regarding the social-economic status of teachers in America and the way in which teachers had organized to improve their welfare seemed to satisfy them, at least. It was with a great deal of pride that we, who considered ourselves ambassadors of democracy, provided answers to these questions.

As time went on, these travelogue descriptions of America no longer seemed to satisfy them. Many of the Japanese began to ask more fundamental questions, questions that went beyond what we ate; how the women wore their hair; descriptions of our school system; and the average salary of elementary school teachers. They wanted to know more about this thing called "democracy" which seemed to be the basic reason accounting for so many of the remarkable differences which they had observed between the American way of doing things and their own.

Whenever Japanese teachers were contacted to determine the problems they encountered in liberalizing their educational programs, one question always appeared: What is democracy, or as they would say it "demo-cracy"? They wanted to know how it operated in the educational, social, political, and economic life of the American people. When they were told that Japanese teachers should become real participants in the activities of the community and assist in the re-education of adults, they would ask: "How are the teachers in America providing educational leadership in their respective communities?" When we criticized the practice of the Ministry of Education in preparing curricula, publishing the textbooks and prescribing in detail how the courses should be taught, they wanted to know how extensively teachers in America actually participated in curriculum development. Just how does an American faculty work out such problems democratically? Just what voice does the average American teacher have in deciding what should be taught as well as how it should be taught?

When we tried to explain our system of supporting public schools, they wanted to know how the poorer communities could support an educational program comparable to that of the more wealthy communities in America. When we condemned their landlord-tenant system, whereby the poor Japanese farmer received such a pitifully small return for his work, they wanted to know how we had solved problems such as these in democratic America.

One well-educated Japanese woman, after noting the presence of negro troops among the occupational forces, asked how we had finally solved the problem of racial prejudices in America.

Finally, with regard to the democratization of Japan, they would ask how the people of a democratic nation such as America felt toward the people of a nation which they had conquered. Do the Americans really believe that Japan should become a democracy? If so, how far are they willing to go in helping her accomplish that goal?

It must be remembered that, for many years, these people had been isolated from all ideologies which were contrary to ultranationalistic militarism. They did not possess the verbalism about democracy, which makes it possible to speak in high-sounding phrases that so often result in obscure meanings. Explanations had to be simple and concrete, as though one were talking with a child. They asked again and again for illustrations of what these principles

meant in terms of actual practices in America. "How do you do it in America?"

For my own satisfaction, I felt that these descriptions had to be given, too frequently, in terms of what are considered ideal practices, rather than what we could actually find to be the common practice in America. In response to the woman's question regarding the way in which we had finally solved the problem of racial prejudices in America, I had to admit that it hadn't been solved. There were marked similarities between their landowner-tenant system of farming and our own undesirable system of share cropping. Some of the condemned features of their system of national education had their counterparts in too many school systems of America. *We may have made remarkable advances in our thinking about the principles of democracy and their application to practices of living in America but we do not have all the answers.*

Regardless of the reasons, America has gained the respect of the other nations. These nations, and especially one country of some 75 million people in the Pacific, are watching us to see how we do it. They want to know democracy's solution to these problems. There is greater need now than ever before for us to be objective, practical and energetic in identifying and attacking these unsolved problems at home. As a result of our position among the nations of the world, we are obligated to point the way. *It can't be done by high-sounding phraseology in international agreements. We must demonstrate that these principles are practical.* We must show the rest of the world that it can be done in America and, furthermore, that it can be applied *in our relations with other nations.*

All of us, who direct educational activities of children, youth or adults, have a grave responsibility for deriving adequate answers to the question, "How is it done in America?"

A COMPARISON OF THE INTERESTS OF EGYPTIAN AND AMERICAN CHILDREN *

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THE importance of children's interests to education is accepted at present as a matter of faith after the recommendation by many eminent educational leaders and philosophers. Since 1920 there has been a great advancement in interest studies and in the utilization of children's interests in education for purposes of guidance, prediction of present talents and future interests, and for planning programs of education and courses of study. There are, however, many questions as to the meanings and educational implications of children's interests.

In 1946, the Horace Mann-Lincoln Institute of School Experimentation began a study of children's interests. This study disclosed many similarities as well as differences among the interests of various groups. The question arose as to whether the observed similarities are due to the nature of human development or to the fact that the groups are living under somewhat similar patterns of culture. To answer such a question, it is believed that further studies like the American one on children of different cultures may be necessary.

The present study on a group of Egyptian children living under decidedly different conditions from those prevailing in America, represents a further step to that taken by the American study in an effort to throw some light on the concept of chil-

* Presented on the program of The National Association for Research in Science Teaching, New York City, February 14, 1949. Based on the author's doctoral thesis at Teachers College, Columbia University, 1949, *A Comparison of the Interests of Egyptian and American Children.*

dren's interests and what they suggest for education. The aims of the present study are:

1. To study wishes, likes, dislikes, in and out of school, and happiest days of a group of Egyptian school children.
2. To review the findings concerning the interests of groups of American children of similar age and to compare them with those of Egyptian school children in order to discover similarities and differences with a view of exploring common and different factors that are at work in the widely different communities.
3. To inquire into the question as to what children's interests as revealed in this study imply for education.

In this study a set of questions on wishes, likes, dislikes, in and out of school, and happiest days was presented to children in the schools of Egypt. The questions were the same as those previously used by the Horace Mann-Lincoln Institute of School Experimentation in communities in the United States. The Egyptian sample was composed of about one thousand children equally distributed among grades which corresponded to grades 5 to 8 in American schools. About equal proportions of children from Cairo and from rural areas were studied. Both sexes were also equally represented. The categories used in analyzing the data were the same ones employed in analyzing the American data. It is a comprehensive set of categories that could be used in analyzing all the responses to different items of the questionnaire. This allows quantitative comparison between the responses to different items.

As the American and Egyptian groups are compared, one notices both resemblances and striking differences. In spite of great differences between the cultures of American and Egyptian children, there are many aspects of interest patterns which are common to both groups. The main points of resemblance between the American and the Egyptian groups are:

1. *There was a tendency for younger children to express more interests pertaining to:*
   a. Material things. Data show that while 59.3 per cent of American 4th–6th grade children expressed interest in material things, only 32.7 per cent of the 7th–9th grade group expressed the same interest. Similarly 18.5 per cent of the Egyption 5th grade group as compared with only 6 per cent of the 8th grade group expressed interest in material things.
   b. Academic work at school. Seventy-three and two-tenths per cent of the American 4th–6th grade group and 63 per cent of the Egyptian 5th grade group mentioned academic work at school in reporting what they liked best at school, as compared with only 52.2 per cent and 45.3 per cent of the American 7th–9th grade group and the Egyptian 8th grade group respectively.
2. *There was a tendency for older children to express more interests in:*
   a. Self-improvement. While 33.2 per cent of the American 4th–6th grade group expressed wishes for self-improvement, 58 per cent of the American 7th–9th grade group expressed similar wishes. Similarly 79.5 per cent of the Egyptian 5th grade group as compared with 90.6 per cent of the 8th grade group expressed wishes for self-improvement.
   b. Happiness and benefits for self. Two and four-tenths per cent of the American 4th–6th grade group and 21 per cent of the Egyptian 5th grade group expressed wishes for happiness and benefits for self, as compared with 5.7 per cent and 35.3 per cent of the American 7th–9th grade group and the Egyptian 8th grade group respectively.
   c. Crafts and mechanical arts at

school. Two per cent of American 4th–6th grade American children as compared with 9.9 per cent of the 7th–9th grade group, and 11 per cent of the Egyptian 5th grade group as compared with 17.3 per cent of the 8th grade group mentioned crafts and mechanical arts in reporting what they liked best at school.

3. *Both American and Egyptian children expressed more interest in arithmetic and their national language than in science or social studies as the following table shows:*

TABLE SHOWING WHAT CHILDREN LIKED BEST AT SCHOOL

	American Group	Egyptian Group
Arithmetic.....	23.4	36.4
National Language..	21.4	36.0
Science.....	5.6	13.0
Social Studies	9.2	9.4

4. *Both American and Egyptian groups expressed little concern about intellectual activities, hobbies and arts, outside of school.* Both groups on the other hand frequently mentioned recreational activities outside of school.
5. *Both American and Egyptian groups expressed a considerable preoccupation with people.* More than 50 per cent of each group mentioned people at least once in responding to the questionnaire.
6. *Both the American and the Egyptian groups showed certain sex differences.* Girls in both groups tended to express less interest than boys relating to material things and recreational activities. On the other hand, larger percentages of girls than of boys expressed wishes pertaining to self improvement and to people.
7. *The interests of both American and Egyptian groups seemed to be greatly self-centered.* Thus, larger percentages of both groups expressed interests pertaining to self-improvement, people, scholastic achievement and artistic production. Many children also expressed dislike for school courses and activities which did not seem to bear an obvious relationship to their own goals.

Insofar as these common tendencies reflect the common nature of human development, education should adopt its program to these developmental sequences. Thus the greater interest of young children in specific material objects suggests the need for greater concreteness in the education of young children with a gradual shift to the abstract as the children grow older. The increase with age in self-improvement in general and especially in achieving vocational competence suggests the greater role of vocational motivations and the increasing importance of vocational guidance as the child grows older. The greater interest of boys of both cultures in sports and of girls in self-improvement suggests differentiation of reading activities, curricular emphasis and extra-curricular opportunities to permit adaptations to these sex differences.

The findings on the other hand show some main differences between American and Egyptian children. The main differences are:

1. *Larger percentages of American than of Egyptian children expressed interests in:*
   a. Material things. Fifty-nine and one-half per cent of the American 4th–6th grade children expressed interest in material things as compared with only 18.5 per cent of the Egyptian 5th grade group. It can, however, be noticed that larger percentages of the Egyptian than of the American children expressed interests pertaining to the subcategories of material things devoted to "food" and "wealth".
   b. Living quarters and living comforts. Although living conditions, particularly in rural areas of Egypt, are of a low standard, yet

almost none of the Egyptian children expressed any concern about living conditions in Egypt, as compared with about seven per cent of the American group.

c. Recreational activities outside of school. Seventy per cent of the American 4th–6th grades group expressed interest in recreational activities outside of school as compared with only 27 per cent of the Egyptian fifth grade group.

d. People outside family circle. About 7 per cent of the 7th–9th grades American group expressed wishes for relatives as compared with about 13.2 per cent of wishes for non-relatives. In the Egyptian group, on the other hand, 26.6 per cent of the 8th grade group expressed wishes for relatives as compared with only 10 per cent of the same group who expressed wishes for non-relatives.

e. Vocations. Although larger percentages of Egyptian than of American children expressed wishes in self-improvement as a main category, yet larger percentages of American than of Egyptian children expressed interest pertaining to the sub-category of vocations. About 15 per cent of the American 4th–6th grades group as compared with only 7 per cent of the Egyptian 5th grade group expressed wishes pertaining to vocations.

2. *Larger percentages of Egyptian than of American children expressed interests pertaining to:*

a. Social and religious wishes. While less than one per cent of the American group expressed wishes pertaining to religious qualities, and almost none of them expressed wishes pertaining to social graces, it can be observed that 12.9 per cent of the Egyptian group expressed wishes of religious nature, and 12.2 per cent expressed wishes pertaining to social graces.

b. Independence for girls. Three and seven-tenths per cent of the American 7th–9th grade girls expressed wishes for being independent or emancipated from home ruling, as compared with 32 per cent of the Egyptian 8th grade girls who lived in Cairo.

c. Relatives. Data pertaining to this point has been mentioned above.

d. School work. This category includes doing home work and preparation for examinations. While 40.1 per cent of the Egyptian group mentioned home work in reporting what they liked best outside of school, less than one per cent of the American group expressed the same interest. Examination pressure in Egypt is very high and the great concern of Egyptian children over examinations has also been reflected in the fact that considerably larger percentages of Egyptian than of American children expressed wishes to pass examinations.

e. It has also been noticed that larger percentages of the Egyptian than of the American children expressed interests pertaining to "national language" and to "health". The Egyptian children also expressed a greater frequency of patriotic wishes and made more frequent mention of people than did the American children. These findings concerning the differences between the American and Egyptian groups suggest that a number of children's interest patterns are a reflection of cultural pressures in one direction or another. The common customs of a community and its standards of what is and is not acceptable are important fac-

tors in molding the interests and concerns of children.

The present study has tried to trace back certain of the interests, concerns, likes and dislikes of the Egyptian groups of children and show the cultural pressures which molded or sanctioned them. It has been noted, for example, that the Egyptian children expressed much concern about certain social values and religious qualities, while the American children did not, and the pressure towards such interests in Egypt have been noted. The educator needs to know which of the interests and concerns of children in his culture are a reflection of specific cultural pressures. Where this is the case, education should trace out the reflection of the expressed interests to the cultural pressures and the basic needs which they serve. The purpose of this analysis will be to determine whether the basic needs are being met in a satisfactory way, one which provides wholesome growth opportunities for the individual, both from the developmental and mental hygienic points of view, and which at the same time meets the community needs and objectives.

The great concern of Egyptian children about examinations may serve as an illustration of the point which has just been made. This concern about examinations can be traced back to desire of the children for a good economic and social position in their society and to the large role played by school examinations in the sharp competition for personal advancement. This concern seems to be the source of many physical, intellectual, and emotional troubles for Egyptian children. Egyptian educators have a responsibility to try to develop educational procedures which will meet the needs of the community for effective selection of those to receive advanced education and take positions of prestige and importance in the community, but which will relieve children from the burdens of the present examination system.

It is concluded, therefore, that the finding that children at a certain age level in a particular society express a particular interest or concern becomes meaningful for education only to the extent that the origins of this particular interest in the social patterns of the community have been investigated.

Another way in which the particular culture appears to influence interests is through the opportunities which it provides for children to have particular types of experiences. The fact that Egyptian children failed to express interests pertaining to such things as social gatherings, hobbies and certain forms of recreation is most likely due to their lack of opportunity to have experiences in these areas. In the same way, the failure of American children to mention foreign languages or religion when questioned about preferred school subjects is a reflection of the absence of those subjects from the American public elementary school.

The fact, therefore, that a particular group of children fails to express interest in a particular item is not necessarily to be taken to mean that the item is not appropriate for the group. Where there is reason to believe that a particular interest can make a good contribution to the wholesome development of the child and to the welfare of society, the fact that only a small percentage of the children express that interest should lead us not to disregard it, but rather to investigate the circumstances which aroused the interest in those who were interested with a view to cultivating it in others.

In other cases, failure of children to express interest or concern in a particular area may mean not that the children's needs relating to the area are lacking, but that the needs are relatively well satisfied. It was found, for example, that the Egyptian

girls, particularly in the higher grades, expressed more wishes to be relieved from home controls than did the American girls. This should not be taken to mean that the American girls care less for freedom, but rather that the amount of freedom which they already experience comes closer to satisfying their needs than is the case for the Egyptian girl, who is very much more limited in that respect.

Another point which seems to be indicated in the results of this study is that expressed interests and concerns depend not only upon an unsatisfied need but also upon acquaintance with possible ways for satisfying that need. Thus, it was found that Egyptian children as a group expressed less interest in material things than did American children. At the same time, the findings of this study and of other studies are in agreement that children from the lower income groups express more desires for material things than do children from the higher income groups. It was also found that the children living in rural areas of Egypt expressed fewer wishes relating to special foods, play materials, or "gadgets" than did those living in Cairo. The more limited interest of the rural children and also the generally lower level of interest expressed by Egyptian children in material things can both be explained by the lack of experiences which would stimulate interest along these lines.

Further evidence concerning the point which has just been made is provided by examination of wishes relating to housing conditions or any wishes for relief from their situation. These same children, who have very few playthings, very seldom expressed wishes relating to the possession of playthings. Thus, it can be concluded that the interests and concerns expressed by children do not necessarily emphasize the basic lacks and shortcomings in their lives.

The appearance of interests in the Egyptian group which are hardly present in the American group, and vice-versa, suggests that children at a particular age level can acquire a greater variety of interests than those which characterize any one population. If other studies like the present one are carried out on still other groups, the list of potential interests will probably be still further extended. The composite picture from a number of cultures will give us a better perspective on the potential interests of children than would be gotten from any single group.

Insofar as the interests of children are dependent on available opportunities, the statements of interests will have value to educators more for diagnosing lacks and shortcomings in the lives of the children than for prescribing the particular activities which are appropriate for those children. It will be the responsibility of education to decide which of the possible interests should be fostered by the schools and to provide the best opportunities for these interests to develop. These decisions must be made in the light of the basic needs and capacities of children and of the social needs and objectives of the community. This suggestion seems to agree with the line of thought expressed by Jersild [1] when he says: "A study of what research in child development alone has offered thus far, does not give the entire answer to the problem of the curriculum. It is necessary to combine the child development approach with a sociological approach in the broadest sense of the word to take account, not only of the opportunities of the growing child, but also of the problems forced by the society in which he lives and the values to which he is committed."

It will also be the role of education to discourage certain interests, to free the child from unnecessary concerns, and to be sure that children have a balanced diet of interests. The domination of one interest, useful though that one be, should not be at

[1] Jersild, Arthur T., and Associates: *Child Development and the Curriculum*, p. 119, Bureau of Publications, Teachers College, Columbia University, New York, 1946.

the expense of other interests which may be as essential for the development of the child as the one already acquired. If the principle just mentioned is applied to the expressed interests of the Egyptian group, then the great concern of these children over examinations, their failure to express interests in hobbies, arts, and crafts in their out of school life, and their social interests as expressed in this study should become matters of great concern to Egyptian educators.

AN AMERICAN EXCHANGE TEACHER VIEWS THE ENGLISH SCHOOL SYSTEM

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WERE it possible to do so, I do not believe I would sell my experience as an exchange teacher to England for a million dollars. Not only has the exchange been invaluable to me in a professional way, but I have also become more world conscious. I realize more than ever that although our ideals, our ideas, and our values are vastly different, basically and fundamentally we are the same. My one great criticism of the program of exchange is that it has not been widely enough publicized in either the States or Great Britain. If I were an administrator, I should urge all of my junior and senior high school teachers to apply for an exchange but I would *insist* that my social studies and English teachers do so.

Although I am a first grade teacher, I doubt the advisability of exchanges in the lower elementary grades. Children of that age find it difficult to adjust to a different pattern of speech and to such vastly different instructional methods. For example, on that never to be forgotten first day in an English school, my six-year-old Cockney children had no idea what I meant when I said, "Take the vase and bring some water for our flowers." They could not hear the word "vase" as I pronounced it, and think vase (väz) as they pronounced it. Also my mid-western pronunciation of water was completely foreign to them. When it was time to begin our work I told the children who had clustered about me that it was time for them to take their chairs. Immediately the entire group dashed to their chairs, picked them up, and started toward the door. As I watched with a feeling of helplessness creeping over me, several of the children chorused "Please Miss, where are we going?" At another time I shocked them into speechlessness when I used the word "napkin" rather than "serviette" when referring to the linen that we place over our laps while we are eating. To them the word napkin means only that little garment worn by an infant, and is never, never referred to in polite society. Numerous other such misunderstandings convinced me that the language barrier is much too difficult for the younger children to overcome.

The educational pattern of Britain is vastly different from our own but its purpose, as is ours, is to meet the needs of their particular type of society. Their public schools are divided into three levels (1) Infant School, (2) Junior School, and (3) Secondary Schools. The Infant Schools include all children from five to seven years of age. The Junior Schools include children from seven to eleven, and the Secondary Schools include children from eleven to fourteen, sixteen, or eighteen depending on the type of secondary school attended.

Britain has free, compulsory education for all from the age of five to fourteen years. The week that a child is five years of age he enters the Infant School and his

formal education begins. In every school in which I observed, reading is taught by the phonetic method. Sounds are taught first. Then the sounds are blended into words. Phrases are taught next. Then sentences. During the first year of reading no emphasis is placed on comprehension, but before we become too critical we must remember that their formal reading begins the week that they are five years of age. Reading is not stressed in the Infant School to the extent that it is in our primary department, but arithmetic is emphasized a great deal more. My six-year-olds in Walthamstow (an industrial suburb of London) were introduced to the four fundamental processes of mathematics. Of course this was presented in a simplified form but nevertheless it was addition, subtraction, multiplication, and division. When learning these processes, each child in the class has twenty counters and a counting board that is marked off into twenty squares. The counters are red, and yellow plastic discs the size of our penny. The answers to their problems are obtained by placing the plastic discs on the squares of the counting board and counting them. Just as much time is given to "doing sums" as is given to reading. Music, art, and physical training are taught in formal situations and are stressed much more than in our primary grades.

Materials and supplies are pitifully scarce due, no doubt, to the recent war, but, by careful planning, the teachers are able to manage. Not one inch of paper is wasted, nor any other materials for that matter. To help the situation the children bring their toys from home one day each week. They are given a free period on "toy day" and the teachers take advantage of the period to stress fair play and sharing.

There is a social welfare worker in each of the Infant Schools who assists the teacher in every way possible. She takes charge in case of accidents and illnesses and makes the necessary dental and medical appointments for the children. She may not, however, go into the classroom as a teacher at any time.

It is a national law that every school in England include in its curriculum twenty minutes of religious instruction each day. In the majority of schools this instruction is given at the beginning of the day. The entire student body and faculty gather in the assembly hall and the headmaster (principal) has charge of the instruction. They not only have scripture study but hymns and prayers as well.

Each child in the public schools, from the Infant through Secondary, has a half pint of milk in the middle of the morning. The milk is furnished by the government with no charge to the child.

There is no grade placement in the schools of England. Children pass from one class to another according to age. No report cards are sent to the parents and apparently the pupils do just as well without them. Neither are the parents privileged to go into the classroom to observe the work being done there.

At the age of seven years the children are sent from the Infant into the Junior School. Here segregation begins. There are very few co-educational Junior or Secondary Schools in England. There is no grade placement in the Junior School but each age group is divided into three streams according to mental ability. The stream placements are made by teacher judgment along with informal tests. Standardized tests are not as popular in England as they are in the United States. The streams are usually referred to as A, B, and C streams. This is their way of taking care of mental differences.

Much the same subject matter is taught in their Junior School that is taught in our upper elementary grades. However, their brighter students are given an opportunity to advance much farther in their academic work than are our upper elementary pupils.

At the age of ten and one-half years each pupil is given an extremely rigid

examination on all of the subject matter that he has had since he entered the Junior School. The result of this competitive examination, coupled with teacher opinion, determines what type of secondary school the pupil will enter at the age of eleven years.

The three types of secondary schools in Britain are (1) Secondary Grammar, (2) Secondary Technical, and (3) Secondary Modern. According to Britain's Ministry of Education, only about ten per cent of the Junior School pupils are placed in the Grammar Schools. The Grammar School is a university preparatory school and has very high academic standards. They are given advanced mathematics, science, and foreign languages. Their Grammar School education is equivalent to that of our colleges. At sixteen they are given what is called their "matriculation" test. If this examination is passed the pupil is urged to continue study in the Grammar School until he is eighteen, then he may enter the university. Admittance to a university will not be granted to anyone under eighteen years of age.

The term "Technical School" is self-explanatory. Pupils who rank high on the "scholarship" examination at the age of ten and one-half years but who are not placed in the Grammar School may apply for admittance to the Technical School. This school gives a general education largely related to one or another of the main branches of industry (including agriculture) or commerce. Such subjects as literature, art, music, history, and religious instruction are also included in the curriculum of the Technical School.

Approximately eighty per cent of the Junior School pupils enter the Secondary Modern school where an all-round program is developed. These children remain in school until they are fourteen years of age. They may not remain longer. The headmaster of the school tries to have a job in view for each pupil as he leaves the school. The majority of these pupils go into the factories or other jobs where unskilled labor is needed.

Throughout the British educational system the creative element is not stressed so much as it is in the States but mastery of subject matter is emphasized much more there than here.

The supply of teachers will be a critical factor in the rate of educational progress in Britain for many years to come. It has been estimated that the total establishment of full-time teachers will have to be raised from the pre-war figure of something under 200,000 to a figure approaching 300,000 before all the developments which form part of the government's policy can be achieved.

There are two main types of training institutions for teachers. They are (1) training colleges which may be provided either by a local educational authority, or by a voluntary body, and (2) training departments provided by a university. The training colleges provide a two-year course for students eighteen years of age and above, who have been educated at a Grammar School. The course covers both academic and professional subjects including practice teaching. Teachers in Infant and Junior Schools with a degree are the exception rather than the rule. Teachers with degrees usually go into the Grammar Schools.

Plans were worked out by the Ministry of Education in consultation with teachers and training colleges for the establishment, immediately after the war, of a number of "emergency" training colleges for men and women from the forces and other forms of national service who wished to enter the teaching profession. These colleges provide an intensive course of training lasting for one year. This college course is followed by two years of probation.

The basic salary scale for teachers throughout England is known as "The Burnham Scale" and is as follows:

	Basic Minimum	Annual Increment	Basic Maximum
Men	300 pounds ($1200)	15 pounds ($60)	555 pounds ($2220)
Women	270 pounds ($1080)	12 pounds ($48)	444 pounds ($1776)

(As the pound had not been devaluated from $4.00 to $2.80 when I was in England, I have used the pre-devaluation basis for this scale.)

For teachers who have spent three years in approved study or training, the minimum and maximum of the scale is increased by one increment. For teachers who have so spent four years the minimum and the maximum is increased by two increments. For teachers who have so spent five years or more the minimum and maximum is increased by three increments. Increments for prior service is as follows: 1 year but less than 3 years—1 increment; 3 years but less than 5 years—2 increments. The maximum number of increments allowable for prior service is ten.

Additional payments are paid to teachers in the "London area" at the rate of 36 pounds per annum rising to 48 pounds per annum from the date on which the teacher has completed 16 full years full-time service in the "London area," or elsewhere or has attained the age of 37 years, whichever is the earlier.

Perhaps school boards and administrators in America would do well to study carefully the British provisions for sick leave and superannuation benefits if they wish to make teaching attractive enough to induct an adequate number of people to enter the profession.

The scale of allowances for sick leave throughout Britain is as follows:

After performing six months actual work.....
Three weeks full pay.

After one year's continuous service.....
Six weeks full pay and six weeks half pay.

After two years continuous service.....
Nine weeks full pay and nine weeks half pay.

After three years continuous service.....
Three calendar months full pay and
Three calendar months half pay.

The following superannuation benefits set up in 1935 for all of Britain:

(1) An annual pension at the age of sixty.
(2) A lump sum at the age of sixty.
(3) A disablement allowance after ten years service.
(4) A short service gratuity after five years service.
(5) A death gratuity after five years service.

A formula given for computing the annual pension is:

$$\frac{\text{Years of service X average salary for last five years of teaching}}{80}$$

In addition to this annual pension a retiring teacher gets a lump sum which is computed thus:

$$\frac{\text{Years of service X average salary for last five years}}{30}$$

Five per cent of the annual salary is the amount the teacher contributes to the superannuation benefits.

Teachers in England secure their positions in much the same way as they do in the States. Upon the completion of their teacher training course they make their application to the local educational authorities in the district where they wish to teach. The local educational committee that employs the teachers is made up of the Director of Education who is appointed by the Ministry of Education and four or five members who are elected by the people.

The United States and Great Britain have much to give each other especially in the field of education. The States, who perpetuate mediocrity by not demanding more from their brighter students could, like England, insist on mastery of subject matter along with a deeper appreciation of the fine arts. England, on the other hand, could learn much from us about bringing out the creative ability of her pupils and also securing more pupil participation in the classroom program. Perhaps the exchange program will hasten the day when the two countries will readily and willingly exchange ideas. Who knows?

TODAY'S NEED FOR BETTER SCIENCE EDUCATION *

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A PARABLE FOR SCIENCE TEACHERS

ONCE upon a time there was a school of deep sea fish living in the ocean. There were old fish, middle-aged fish, and some very young fish in this great school. These fish had become so well adapted to living in the depths of the ocean that there appeared to be no need for considering either greater depths or the shallower waters. It had become a tradition that life at their depth was the only good life.

Some of the younger fish—the fingerlings, however, seemed to doubt this tradition and it had become a custom for the old fish in the school to hold an "orientation" period for the young fish at the time when they began to look around. It is reported that the oldest and most respected citizen of the school blurped the tradition about as follows: "Our life is here. Food is abundant. It is comfortable. We cannot easily be reached. It is a good life. Furthermore, some members of our school—previous members that is—bless their souls, journeyed to the surface but never returned. Meager reports affirm our belief that there is nothing better at the surface, nothing but darkness and vicious enemies. Our life is here. Let no one, individually or otherwise, think, plan or act otherwise."

Now as often happens in any school, there was a fingerling who felt an irresistible urge to probe the unknown—I suppose we would call this the scientific urge. So he slipped away from the school and started upward. He arrived at the surface on a beautifully moonlight night. The golden light must have stirred him deeply. He met with no enemies, but returned to the school unnoticed. However, he could hardly wait for a chance to blurp out his experiences to his peers. Soon these blurps or glorifications of them, began to reach the elders and it worried them greatly. They decided to call an emergency assembly of the school. As this assembly they tried to most solemnly reaffirm the traditions, squelch the rumors, and curb further exploration.

Again the urge to probe the unknown and personally check on reports proved irresistible to a young fingerling. He too slipped away from the school and arrived at the surface on a calm starlight night without a moon. Meeting no vicious enemies he rejoined the school and soon found opportunities to blurp out his experiences. Again the new reports and rumors reached the elders and they decided to bring the matter before the School Board. After due deliberations they decided that all the members of the school who might have any urge to explore should be called to a special meeting. At this meeting the stating of the tradition, affirming its dependability, and squelching of rumors, together with threats of awful consequences, moved along exactly as planned. It seemed to leave a very deep impression on the school and everything was quiet for many months, at least there were no incidents—until a fingerling returned to the school after a period of truancy and blurped out to his peers about the dazzling light he had seen at the surface. Having arrived on a clear sunshiny day he had been all but overcome by the brilliant light and he told his story with feeling. When these rumors reached the elders there was no time lost in organizing a citizens' committee to help the school find a conclusive solution.

The curiosity of youthful minds being what it is, the citizens' committee considered it desirable to propose that there be selected—democratically—a committee from among the most respected members of the school. After careful planning and preparing for all possible hazards this committee would go to the surface and upon their re-

* Presented at the luncheon of the Oklahoma Science Teachers Association, Oklahoma City, October 14, 1949.

turn, if indeed they were fortunate enough to return, their report would establish for all time to come the traditions concerning life at higher levels.

It was a solemn occasion when members of the school said goodbye to their fathers and brothers, and in one case a sister. The committee reached the surface, at least as far as any surface could be recognized, on a cloudy, dark, rainy, and stormy night. They had trouble with intercommunication in the group. Some members were soon lost although a few of these managed to return to the group later. The report presented upon their return to the school affirmed by appearance, lost members, and the pathetic blurps of the survivors that the traditions as previously stated and affirmed were certainly not to be questioned. Perhaps this is the reason why specimens of deep ocean fish are only very rarely collected at the surface.

INTERPRETING THE PARABLE

This hypothetical account may serve as a parable for science teachers. Great numbers of science teachers are submerged in an ocean of details. Large classes, laboratory sections, experiments to be arranged and tried out, equipment to be cleaned up and put away, textbooks, outlines frayed through wear, lost and found articles, class parties, football ticket-taking, assembly programs and dozens of other items might be listed. Such details coupled with traditional methods make the educational media for the pupils cloudy if not murky. There are reports, now and then, of new materials and procedures and these reports are eagerly discussed by a few teachers, but there isn't much change in what happens in the school. Here and there individual science teachers rise to the surface and become enthused by what they experience and discover. They report their experiences to some of their co-workers and get willing listeners. However, many of their accounts do not get beyond their own school and sometimes the weight of tradition in the school crushes the efforts to recognize the needs of youth for better science education. There is a tendency to forget that tradition should be a rudder rather than an anchor. There are some developments and needs that surface-seeking science teachers are talking about. They are talking about real experiences. They have found ways of rising above murky indifference. Some have seen the moonlight of scientific attitudes, some the starlight of controlled experiments and some the brilliant sunshine of scientific methods. They have tried them and found them understood and eagerly sought by the youth. Regardless of the sincerity of the elders, they know that science teaching can be better than what it has been.

The tremendous technical developments of recent years and their even more tremendous social implications should cause all of us as science teachers to face our responsibilities with great humbleness. We must face the sobering task of helping in effective ways to communicate these modern developments and the scientific bases upon which they rest not only to our high school youth but to all persons in our communities. We must do this because as never before we need a scientifically informed citizenry. Decisions concerning developments and applications of science are the responsibility of all citizens. Oftentimes there are direct responsibilities for decisions concerning home, community, state and national questions. There are also many occasions where citizens should communicate their ideas concerning decisions to elected or otherwise selected representatives. Since a very large number of present day issues involve science we as science teachers have responsibilities which are, if we will but believe it, truly great opportunities. We need to work with others as well as to plan for ourselves how to most effectively make science a part of the education of every boy and girl, every young man and young woman, and every adult. More specifically (1) we need to

encourage and assist in the development of science work in the elementary schools, (2) we need to restudy our general science, biology, physics, chemistry, and other high school science offerings and to seek ways for making them more significant and sequential. (3) We need to work cooperatively with the social studies, English, Mathematical, Industrial Arts, vocational, and other teachers so that we articulate better with other areas and so that we get more significant relationship to life in home, school, and community. (4) We need to become skillful in the ways and means which are available for the infusing of science into the thinking and actions of all citizens of our communities.

It should be our irresistible urge to see science and its social implications reaching all pupils at all grade levels. It should be our irresistible urge to see the science activities in the school program developmental and sequential, and in harmony with the spirit and nature of science. There have been too many courses planned without considering science, and too many science courses have been planned in isolation without considering adequately the previous, concurrent, and succeeding courses or experiences. No one notices the repetitiousness and disjointedness more than the pupils who should sense unity and harmony in the successive and parallel science experiences. Without unity, harmony, and significance, the pupils develop an indifference to or dislike of science—the very opposite of what we need to achieve. In brief, then, there is a need for a planned science program from kindergarten through the fourteenth grade. Such a program should be developmental and sequential as well as full of meaning and interest to the pupils.

A PROGRAM OF SCIENCE INSTRUCTION

How do we go about meeting our basic need for a program of science instruction? It seems to me that we as science teachers need first of all to make a change in attitude. We need to demonstrate by our words and actions that there are non-science subjects that are very important in the education of youth. We should feel happy rather than resentful when some of the science work which we have been doing is made a part of other studies. We should encourage such a change and we should be helping to make it a *real science* experience. We should also look with favor on the growth of science activities in elementary schools and we should be willing to help in the selection and planning of such activities. Such attitudes on our part will make us acceptable for committee work where plans are made for curriculum changes. All too often we have not been included because of our attitude that science is something which only a science teacher can understand, therefore, only a science teacher should teach science. There is literature of science, history of science, mathematics of science, scientific art and music, and shop science. We want these to reach all citizens and we cannot do it ourselves. There are however certain aspects which we as science teachers can do and must do.

In addition to a change in attitude we need to sharpen our ideas of what science really is and what it can do. There is much vagueness among science teachers concerning the aims and methods that make their subject uniquely valuable in the education of youth. We sometimes decry the amounts of time which various subject groups require of the pupils but we often reveal confusion and narrowness when called upon to justify time and facilities for science. Just try stating in laymen's language and in a few short paragraphs why science is worthy of a major place in the school curriculum. Try to indicate just what science has that other subjects do not have. Try to make it reasonable and important that this special something be included. We need to clarify our ideas of what science is and what it can do to our youth, our adults, our homes and communities, our nation and world.

We need to become skillful in using the techniques that are clearly scientific. Let

us make experiments with real things as a setting for learning one of our highly developed skills and let us make it an ever present aspect of our teaching. We may be excused for mediocre use of textbooks, reference books, films, and other aids but there is no adequate excuse for our reducing almost to the point of rarity careful and thoughtful experimentation. We may be excused for awkward use of socialized procedures but there is no adequate excuse for indifferent use of scientific methods. Let us admit that we are to a large degree to blame for the idea that science teaching consists of reading about and talking about science. We have something very special in experiments to be demonstrated in the classroom or performed in the laboratory. Experiments are uniquely scientific and we should use them with all the skill and appeal that we can muster.

SCIENCE TEACHING IN THE CLASSROOM

You may find it difficult or impossible to do much about a twelve or fourteen year science program, but you can do something about your own science courses and your science classes. Let me ask a few questions about your courses and your teaching and to propose some more specific ways to meet today's needs for better science teaching.

I. Are you teaching topics as indicated in an outline or book or are you teaching boys and girls? Are you developing the subject or are you developing abilities to solve real problems?

In these two questions as in the questions which will follow, the place of emphasis is the determining factor of success in meeting today's needs. You are teaching topics and developing the subject if you begin with fundamentals and after such teaching you consider applications, if you say you cannot cover the course by group work and projects, and if you are unwilling to devote a period or two for pupils to dramatize and otherwise express what they have learned. When you are concerned about pupil and societal needs you will begin with applications that pupils are curious about, you will encourage them and help them to see how various parts of the applications are possible, and you will help them to sense a need for the fundamentals which are then developed and related to the applications. You will also help pupils put what they have learned into forms that are socially acceptable to other pupils and to parents and other adults so that the work in school can be a means of information and education for citizens of the community. Only through the positive help of our science students can we do the job of public enlightenment which needs to be done.

II. Are you encouraging pupils to depend upon a book or teacher as a check on accuracy or upon their own observations and interpretations? Do you at times demonstrate experiments which do not work or do you give the impression that experiments always work but sometimes as you do not expect?

You are resorting to authorities such as would be expected in any non-science class if you allow your students to use the textbook as a final check on accuracy, if you encourage pupils to find how an experiment should turn out by reading about it, if you accept as the current report of an experiment what should have happened rather than what did happen, and if you constantly reserve the right to approve or disapprove a report. We can, on the other hand, make assignments from books so that contradictory answers are reported thus opening the question about what makes a statement right. We can encourage pupils to report in their own words just what was done and just what happened and we can condition pupils so that they will ask authorities for their proof rather than accepting any printed or spoken statement as true.

In a biology class the teacher was testing human urine for sugar. He had been to the local hospital and found out how this was really done and he was showing the class

the tests both with positive and negative samples. In his enthusiasm for the demonstration he described in words what he would do and what would happen. He went through the tests again telling what he was doing and describing the color changes. The great weakness in the procedure was the fact that a pupil could have been blind and still have given a good report. How much better it would have been if he had mentioned briefly about his visit to the hospital and given the names of the test solutions and samples. Then he might have said: "Now I want you to observe and report the tests. I will carry through the tests but I will not say a word. I will do each test twice and I want you to report in writing as honestly and accurately as you can just what was done and what happened." Each report would then have been different. Each pupil would have felt responsible for careful observation. There would be growth in the ability to observe accurately and describe honestly if this general procedure were continued through the year. In evaluating the report of a student the experiment itself would be a basis for determining accuracy. Every experiment works as it must under the conditions even if the results are different from what may have been expected. If the book reports a different result then there is the problem of discovering why.

Some science teachers in trying to develop abilities to observe and describe will deliberately try to mislead pupils by what they say while performing an experiment or demonstration. One teacher even distributed what he said was a report prepared by a previous student and said that pupils could use parts or all of this report in stating what was done and what happened. Selecting portions that were not observable were considered errors. It is important for youth to learn how to search out the truth in the face of all that is written and said. It is important that they learn how to grow in the skills of careful observing and honest reporting.

III. Do you use films, slide films, and slides as sources for facts and settings for learning or do you use them because they happen to be available and pupils like them? Do you use models and charts to visualize your teaching or do you encourage pupils to make models and charts to express their impressions?

Photography both single and successive are used more and more to record conditions and happenings. Where changes are very rapid or very slow the eye alone is not very effective. Where distances are great and conditions are unfavorable photography becomes almost the sole means for records. Furthermore, results are often expressed in the form of graphs and models. In the science of astronomy, photographs as sources for facts are very important.

As an example, suppose you were studying the sun. Here you may have a photographic slide or a photograph of the sun showing corona, prominences, and sun spots. This could be projected and you could ask pupils to use a meter or yard stick and measure the sun's diameter on the screen. They could also measure the corona, prominences, and sun spots. When they learn from the book that the sun's diameter is really 866,000 miles they can themselves compute the height of the corona and prominences as well as the size of the sun spots, and they are doing it like astronomers. The same general procedure can be applied to the moon and planets. Where models, charts and graphs show the scale the true dimensions can be determined. Experiments shown on a film can be reported as if they were actual experiments, that is—what was done and what happened. By such procedures the visual aids become means to an end rather than ends in themselves. I remember a science teacher who had his pupils make clay models of animal and plant forms rather than asking for drawings. These models were of great interest at the school open house and I am sure they were centers of interest at home.

IV. Do you require three, five, or ten days for developing a problem or can you develop several problems or topics in one period?

In the minds of many teachers a problem is about the same as a question. I know a textbook that shows thirty or more problems under a single topic. A problem as a center of learning may well require two weeks to complete. If you try to help pupils sense the different aspects of a problem and then help them to gather evidence from experiments, visual aids, textbooks, reference books, and from people, this alone will take several periods. If you then help them to sense relationships between bits of evidence and guide them to apply their generalizations to many and varied situations, again this will require a few days. If you finally help them to correct their generalizations and to express what they have learned in interesting ways, one or more additional class periods will be required. When we consider the fact that scientists often spend years in refining their problems, gathering evidence, and relating findings while additional months and years may be used in applying their findings to something useful, we should not feel that we are unscientific if we devote a couple weeks to giving youth miniature experiences with the scientific methods. If you follow a problem development approach you will organize your course in terms of three or four major problems per term and each of these may be broken down into two or three problems for more careful study.

V. Do you expect all your pupils to do about the same things or do you plan and provide time for a variety of individual and group projects? Do you arrange guides for learning which require your presence and controlling influence or do your guides make it possible for learning to go on when you are inconspicuous or out of the room?

We are all familiar with wide differences in interests, abilities, and rates of learning among pupils. Even under homogeneous grouping these differences are so great that adjusted learning guides would be helpful. We know that when pupils leave school that they will no longer have a teacher to urge them on and textbooks to meet their assignments. Nevertheless, we continue to teach classes rather than arranging instructional guides which make possible committee work and individualized procedures. While teachers of teachers in our Colleges and Universities discuss group and individual procedures, they have, in many cases, never tried to use them with classes of 36–40 high school pupils. There are wide gaps between theory and actual practice. Certain topics such as metals in chemistry, small living things in biology, machines in general science, and radiation in physics, lend themselves to group and committee procedures. Almost any topic can be arranged as a long assignment, contract, mastery unit, or some other individualized procedure but topics where there is rather abundant text and reference information are especially suitable. The difficulty is how do you get ready for such work and how do you guide it and measure results. There is a great need for materials that have been arranged by teachers and revised after actual trials with pupils. If we are to recognize individual and group needs we must become skilled in developing and using learning guides for individual and group work. We need to teach individual responsibility for achievement as well as abilities to work cooperatively with others on a common task. We as science teachers need to consider how we can make these a part of our science teaching.

VI. Do your tests and examinations ask mostly for facts and statements that pupils can memorize or do you test for changes in interest, growth in abilities to find facts, changes in facility to apply facts and other changes? Do you leave a topic when it has been covered or do you consider ways in which the learning can be made interesting to others?

The question of what to do when a topic has been studied has not received sufficient attention by science teachers. Sometimes it means a test and the handing in of notebooks with extra work for the teacher as a result. Sometimes it means a sigh of relief on the part of pupils and teacher. I wish that there were time to discuss various types of tests; application of principles, cause and effect relationship, sufficiency of data, and the like. We could discuss how to prepare better true-false, multiple choice, matching and essay examinations. We could discuss answer forms and simplified ways of grading tests. We could discuss self-checking of notebooks and tests.

Let us instead discuss the importance of helping pupils learn how to communicate what they have learned to other pupils and to parents and other laymen in the community. So much of what we have our pupils do is not talked about with enthusiasm at home or elsewhere. Suppose you were to say something like this when you have completed a topic: "You have now learned a lot about this topic, suppose we try to express what we have learned in interesting ways. For example, I want you to write the next four lines to this jingle, 'The earth to me is mighty vast.'" Then you give time for thinking and insist upon scientific accuracy in the ideas expressed in the lines written by the pupils. A little freedom and fun is in order because pupils should learn that science can be used for fun too. Other pupils could be encouraged and helped to work up a radio presentation with sound effects. Some others could make cartoons while others make models. There can be reports written for the school paper and the local newspaper. Certain experiments can be photographed and legends prepared. Such things will cause the pupils to spread science throughout the school and to talk about it at home. Assembly programs, radio presentations, store window displays, talks before service clubs, and other ways to communicate science to others may be used. Public education is our job and for such purposes we need to give attention to the ways in which ideas reach the public.

TEACHING POTENTIAL SCIENTISTS

I would be neglecting another and perhaps equally important facet of our responsibility if I failed to emphasize another aspect of our job; namely the need for nurturing boys and girls who have the abilities that contribute to success in scientific careers. You and I were trained by our college science teachers to be prepared for this kind of teaching. We were taught by the same methods and materials as were planned for students looking toward scientific careers. In fact, many of us have gone a long way toward becoming scientists. Opportunities and inclinations have made us teachers of science. The teaching of potential scientists would be very easy for us were we free of the large number of students who cannot or will not look seriously toward careers in science. The very weight of numbers causes us to emphasize general education values and neglect those precious young minds who must share in keeping our nation prosperous and secure. What can we do in our classes to help the students with high abilities? Let us look at some questions about methods and materials in studying possibilities.

1. Do you often take time and trouble to encourage and help able pupils to go beyond what is expected of other pupils?
2. Are reference and source books in your library or classroom often checked out and used by your able students?
3. Do you secure materials and encourage students to study reports of what scientists in public service and industries are doing?
4. Do you several times a year arrange for amateur or professional scientists to come to your classes or clubs and discuss their interests and to point out career opportunities?
5. Do you take an active part in helping pupils develop creative projects for school open-house, science fairs, junior academies of science, and the like?
6. Do you invite and take several of your able students to meetings of a scientific character in your community and State?
7. Do you encourage your able students in general science and biology to elect upper level science courses or study correspondence science

courses which are rather definitely college preparatory in nature?

8. Do you have a course or club which emphasizes experimental laboratory techniques, in which able pupils help you arrange and try out experiments, clean up and put away equipment, learn useful techniques employed on a routine basis in industries, and engage in research projects with you and by themselves?

9. Do you give the impression that being a science teacher is a really interesting career as well as a stepping stone to other scientific careers?

10. Do you invite your former students to come to visit class when they are home on vacation?

11. Do a number of your pupils try for scholarships, fellowships, assistanceships and other forms of recognition which looks toward college training in the sciences?

SUMMARY

We as science teachers face a dual responsibility. We must effectively contribute to and promote the general scientific enlightenment of all citizens. We must at the same time, and often in the same classes, provide challenge and training for potential scientists. Only through careful and thoughtful planning for both of these responsibilities can we adequately recognize individual and societal needs in this age of science and technology.

Our general education responsibilities are difficult to meet because our own high school and college studies were focused on specialized work in science. We did not have opportunities to study and experience socialized and individualized procedures. Our nurturing of talented youth is made difficult by the large numbers of pupils in our classes who need general education rather than specialized education. Meeting our dual responsibilities within regular classes requires a variety of materials and procedures which we must learn and perfect on the job and often with little guidance.

Many science teachers have become skillful in meeting individual and societal needs. Through mutual sharing of helpful ideas in meetings and through printed materials we can grow in teaching effectiveness.

Science can be one of the most interesting and worthwhile courses in a school. We have techniques and materials that add something extra to the emphasis on reading and talking as sources for and evaluation of ideas. We can put adventure into school work. We can get students to talk about science at school and in the community. We can win approval for additional supplies, equipment, films, slides and other teaching aids. We can revise existing courses and plan elective science courses that pupils will appreciate. We can make science permeate the school and community. These we can do and these we need to do.

TWO WORKSHOPS IN SCIENCE EDUCATION

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THE purpose of this paper is to describe and to give a general subjective evaluation of two workshops in science education sponsored by The University of Chicago during the summer of 1948. It is the hope of the writer that this account will be of value to others who are planning to conduct similar workshops.

1. *Workshop in Curriculum Problems in Secondary School Science*

The following is quoted from the circular describing this workshop:

". . . This workshop is designed to assist teachers and supervisors of science in Chicago and its environs who have special problems in curriculum construction or modification in the fields of high school or junior college science. An attempt will be made to limit the membership of the workshop to individuals with common or allied problems. This will allow for dividing the large group into three or four small ones, each working towards a common goal. It will be the aim of this workshop to produce curricular materials which can be put to the test in the field during the school year 1948–9.

"Extensive library resources will be available to the members of the workshop. The library of the Department of Education is unusually well-equipped for research and study purposes. A

curriculum laboratory maintained by the library provides a selected collection of curriculum guides and other materials.

"For those interested in the construction of teaching apparatus to be used in conjunction with the developed curricular materials, bench and hand tool facilities, and laboratory space and equipment will be available. Facilities for the study of audio-visual instructional materials will also be available.

"The membership of the workshop will be limited to fifteen."

Twelve people registered for the workshop. Ten of the registrants were regularly-appointed science teachers in the Chicago high schools, one was a newly-appointed principal, and another was a physical science teacher in a small Michigan high school.

The workshop was conducted during the first half of the summer quarter—a period of approximately five weeks. Sufficient academic credit was given for the workshop to permit of the use of the entire day for its activities. None of the students were registered for any other course during the workshop period.

At registration, each student was given a copy of a brochure of some forty mimeographed pages. The following paragraphs taken from its introduction, will indicate the purpose of the brochure:

"These notes are intended to serve two major purposes. For those members of the workshop who have had little actual experience in the construction of science curricula or curricular materials, they are intended to serve as an instrument of orientation to the general field. For those members who have not determined on the nature of their participation in the workshop, these notes may serve to indicate appropriate avenues of effort.

"The spirit in which these notes are offered should be as clear to the receivers as it is to the transmitter. The *Workshop in Curriculum Problems in Secondary School Science* is a cooperative enterprise. These notes should be regarded as the partial contribution of one of the members. The collator-author assumes full responsibility for them; and offers them, not as dogma, but as suggestions."

The following Summary of Contents of the brochure may be of interest to the present reader:

I. Definition of Terms
II. The Curriculum in General
  A. Philosophy
  B. Construction and revision
  C. Background of curriculum workers
III. Newer Trends in Science Curricula and Courses
  A. The method of "major generalizations"
  B. Trends in secondary school curricula
  C. Modernization of old science courses and the construction of some new ones
IV. Objectives for the Curriculum
  A. General remarks
  B. Criteria for the selection of objectives
  C. Objectives of higher education
  D. Objectives for science education
V. Learning Activities and the Curriculum
  A. Selection of learning activities
  B. Types of learning activities
  C. Aids most commonly used in teaching
VI. Evaluation of the Curriculum
  A. Purposes
  B. General procedures
  C. Specific types of evaluation processes
VII. Suggestions for Members of the Workshop
VIII. Bibliography
IX. Additional Reading Suggestions
X. The University of Chicago Library

The following paragraph is taken from Section VII, Suggestions for Members of the Workshop:

"It is hoped that each member of the workshop will come prepared to work on his own special curriculum problem in the field of secondary school science. If common or allied problems exist among the members, small groups, based on the common goals set by the individuals, will be formed. It is suggested that we use the scheduled class hours for the purposes of discussing the basic planning and for critically evaluating the actual materials prepared by the individuals and groups."

For those who were uncertain as to the exact nature of their workshop activity, a list of suggested activities was also included in Section VII of the notes. The nature of each such activity was discussed, and where it was believed necessary, a bibliography was included. The following is a summary of the suggested activities:

1. Development or revision of a course of study, a syllabus or a teaching unit in science.
2. Compilation of a schedule of instructional materials (including an annotated bibliography, a list of experiments, demonstrations and other learning activities, and a list of laboratory apparatus and other teaching aids) to be used with an existing course of study, syllabus, or teaching unit in science.
3. Preparation of an evaluation program for an existing course of study in science.
4. Reporting of curriculum records, or descrip-

tive accounts of actual curriculum experiences of children showing how the activity originated, the steps taken in developing it, the successes and failures, the materials and devices found useful, the values received, and so forth.
5. Preparation of child development materials.
6. Preparation of community resource studies.
7. Preparation of teaching guides on how to carry on specific educational tasks such as conducting discussions, planning excursions, using visual aids, planning laboratory lessons, and so forth.
8. Preparation of source units.
9. Preparation of a report on the implications for secondary school science of a National Science Foundation Law.
10. A study of extra-curricular activities in the field of secondary school science.

The workshop day was divided into two sessions. The morning period, lasting from 9:30 to approximately 11:30 daily, was devoted to several types of activity. During the first week, the students presented their workshop plans to the group for criticism; during the next three and one-half weeks, each student had several opportunities to present the results of his work to the entire group; and during the last three or four days of the workshop period, the morning session was used for general seminar purposes. Occasionally, this period was used for presentations by invited speakers.

The afternoon period served, for the most part, as a work period. The instructor was available each afternoon for conferences with individuals. Occasionally, afternoons were spent in special activities which will be described below.

It became evident during the first week that some of the students had problems and questions related to science teaching (aside from their selected workshop problems) which could best be answered by authorities available at the University or in Chicago itself, and through the medium of field trips or visits. This matter was presented to the group, and it was decided that if the interest in a particular problem or question was general enough, the method used in the solution would be scheduled as a workshop activity. As a general rule, all of the members of the workshop participated in these special activities, a schedule of which follows:

Trip to Encyclopedia Britannica Films at Wilmette, Illinois, for a description of science educational film production problems and techniques and to view experimental and new science films.

Trip to the Chicago Museum of Science and Industry to study the ways in which the Museum can function in secondary science education.

Talk by invited speaker on the reorganization of the general science course in the Chicago schools.

Talk by invited speaker on the Chicago elementary science curriculum and its implications for teachers of secondary school science.

Laboratory session on the use of thermo-setting plastics.

Visit to the Department of Education's Audio-Visual Instructional Materials Center for a demonstration of new projection equipment.

Talk by invited speaker on the problem of evaluating science instruction, particularly that phase which is intended to produce changes in pupil behavior in the application of the scientific method and its associated attitudes to problems of everyday living.

Trip to the Chicago Natural History Museum to study the ways in which the Museum can function in secondary school science education; and to examine the research collections, visit the taxidermy shop, and to learn more about the "behind the exhibit cases" part of the Museum.

Rock and fossil collecting trip to Palos Hills and Thornton Quarry.

Trip to the South District Filtration Plant to examine and observe the operation of an electron microscope.

The following is a list of the workshop projects completed by the members:

A course of study in gardening.

A one-year course of study in general biology.

General science unit: How do plants manufacture food?

General science unit: The human body.

A series of motivation questions for a course in high school chemistry.

Tests in high school chemistry designed to test thinking and reasoning.

Procedures for using high school chemistry to train students to think reflectively.

A guide for a geology field trip to Palos Park, Illinois.

A list of low cost and free supplementary teaching materials.

Study guides for first semester high school physics.

A schedule of instructional materials to parallel the Chicago course in general biology.

A minimum vocabulary list for the fall semester of the Chicago course in general biology.
A bibliography of graded reading materials and silent films to parallel the unit on trees in the Chicago course in general biology.
A source unit on weeds.
A source unit on "intelligence" in insects.
A story: Touring the land of the hookworm.
A study guide for the Chicago course in general science.
A unit on photography.
A source unit on conservation.

The following comments concerning the conduct and administration of the workshop may be of value to the reader:

1. It is essential for a successful workshop that good library, laboratory, and shop facilities be available. Occasionally, additional facilities may also be required. One member of the workshop who had had little experience in photographic techniques, but in whose school photography was a very popular hobby, decided to prepare a unit on photography as his workshop project. The University photographer was extremely cooperative; he allowed the student to observe the various activities carried on in his laboratory, and later, allotted the student work space. Part of this student's final report consisted of lantern slides and prints prepared by himself, in which several common photographic processes were illustrated.
2. The fact that a room was assigned to the workshop group for the entire day was also very helpful. At various times, the room served as a classroom, a meeting place, a display room, a conference room, a work room, and as a demonstration room. It was the campus "home" for the workshop members.
3. The workshop was fortunate in having available the part-time services of a typist-mimeographer. Each member of the group received a copy of the final report of every other member.
4. The Department of Education provided social and leisure time activities for the members of all the workshops on campus. Frequent social hours were scheduled during the summer quarter, and arts and crafts instruction and facilities were available for those interested.
5. Final grades for the members of the group were determined by a self-evaluation process. During the last week, the students were asked to turn in to the instructor, an estimate of the value of their workshop contributions, i.e., their workshop project or projects, their participation in the general discussions, their helpfulness to the other members, and so forth. The students understood that their evaluation would be the official grade turned in by the instructor. One student did not hand in such an estimate. One of the students turned in a self-evaluation of "B." This was changed to an "A" by the instructor. It is the opinion of the writer that the students' estimates, with one exception, were accurate and fair ones.
6. At the request of the students, the last few morning sessions of the workshop were devoted to seminar discussions of such problems as the use of the textbook, the value of the laboratory lesson, and the establishment of criteria for the selection of instructional materials. The instructor or one of the students began each seminar with a short introductory talk defining the problem. This was followed by a general discussion and a final summary by the leader.
7. One of the original workshop plans that did not materialize was the grouping of the individual members into small units, each of which would work on a common curricular problem. The highly individualized interests of the members of this group made such a procedure impossible. In general, each student worked on one or more problems which had little or no relation to those of his fellows. Under other circumstances, the original plan may be preferable to the one actually followed. It would seem likely that such a procedure would result in the preparation of more fully-developed materials which would have a much wider application than those produced by the members of this workshop group.

It must be obvious from the foregoing that the writer feels that this workshop was a highly successful venture. He enjoyed this workshop experience as much as any science education activity in which he had ever been engaged.

It is the writer's impression that the students found the workshop valuable and thoroughly enjoyable. They sensed immediately that this was their workshop, and not the instructor's. The students seemed to favor particularly the almost complete absence of formal presentations so characteristic of science education courses in their experience. They seemed to enjoy the opportunity of working intensively, and at their own pace, on a problem of their own choice. The fact that the instructor was always available for personal conference was also a point of favor.

The quality of the materials produced by the students varied. Some of the materials, particularly the source units, were very well prepared, and capable of being widely applied and used. The projects developed by some of the students were highly parochial. The writer feels that the purpose of

the workshop was fully achieved in that each of the students prepared materials for which he had a specific need.

It is likely that lacking the excellent workshop facilities, the counsel of fellow teachers, and the unhurried, academic atmosphere, that many of these materials might never have been prepared. It is certainly true that the quality of the materials, because of the above-mentioned factors, would be superior to any prepared under the more usual working conditions enjoyed by a teacher.

2. *Pre-School Workshop on Curriculum Revision*

This workshop was organized by a nearby public school system for members of its teaching staff, and was conducted in cooperation with The University of Chicago which provided a staff of consultants. The workshop was held during the 10-day period immediately preceding Labor Day.

The day was usually divided into two sessions; a morning one, lasting from 8:00 to 11:30, and an afternoon session lasting from 12:30 to 2:30.

The morning sessions were devoted to meetings of area groups, i.e., groups interested in the language arts, in social studies, in science, in mathematics, and so forth. Each area group consisted of representatives from kindergarten, primary, intermediate, junior high, and senior high school levels and a consultant. One of the members served as a group leader, and another as a recorder.

The afternoon sessions were used for child study symposia and discussions. Each teacher attended both morning and afternoon sessions.

At the first meeting of the science area group, the members decided to work on the development of a series of generalizations which could be used in the construction of a twelve-year science sequence. The entire eight-day work period was used in formulating the generalizations, in breaking them down into contributing understandings, and in selecting suitable learning activities for each grade level.

The generalizations formulated by the group as a basis for the sequence were the following:

1. Man has a food problem.
2. Man uses many machines to make his work easier.
3. Man has a need to conserve his natural resources.
4. Man is constantly striving to conserve human resources.
5. Man is continually learning more and more about his biological and physical surroundings.
6. Man must adapt himself to changes in the weather and to different climates.

Each member of the science area group worked on the development of one or more of these generalizations for his own grade level. Guidance was provided by the junior and senior high school teachers and by the consultant. In one or two of the early sessions, these members demonstrated how two of the large generalizations could be subdivided into smaller and smaller understandings, and how learning activities are selected.

It was, of course, impossible to complete a project of this magnitude in the little time available. However, it was felt that if the interest in the development of such a program continued, the teachers had received a sufficient preliminary knowledge of procedure to work by themselves or with the assistance of the science teachers in the higher levels.

The writer was dissatisfied with several of the features of the area group portion of this workshop. In general, the elementary school teachers were not well enough trained in either the subject matter of science or in curriculum construction, to attempt the kind of program they had mapped out for themselves. In many cases, an interest in science teaching was lacking entirely. The net result of these deficiencies was that after one or two meetings in the fall, the entire program in science was dropped. The group decided to substitute the preparation of guide sheets to the local sewage disposal plant, dairy, power plant

and other community "science teaching resources" for the original project.

The strong possibility of having a group of teachers with little or no background in curriculum work was recognized by the writer when he planned the workshop described in the first part of this paper. An attempt was made then to overcome this serious shortcoming by providing a set of notes including reading lists. Because of the shortness of the workshop period, this method was considered unsuited to the second situation.

It might have been preferable in the second workshop to have discussed methods of evaluating an existing curriculum and methods of revising and constructing new curricula. The teachers might then have been better prepared to tackle the job of constructing a science curriculum during the regular school year or at a second workshop.

It is the writer's belief that a workshop in science education will function more successfully if all the students are interested in approximately the same grade level of science teaching.

Another difficulty with the second workshop program was that too much was planned for a relatively short period. A less ambitious program, with more time allowed for library research, conferences, reading, consultation, and so forth, might have resulted in a more successful workshop.

BOOK REVIEWS

LATON, ANITA D. AND POWERS, S. RALPH. *New Directions in Science Teaching.* New York: McGraw-Hill Book Company, 1949. 164 p. $2.50.

New Directions in Science Teaching describes and interprets the experiences of a widespread group of teachers who cooperated with the Bureau of Educational Research in Science Teaching at Teachers College, Columbia University, in applying current educational theory to the education of youth in senior high school. The work of alert, forward-looking teachers in regular classroom conditions in teaching science is described.

Every effort was made to take account of recent advances in educational theory and science, including researches in the growth and development of children, use of community resources, the learning process, and group planning. The book includes a wealth of suggestions for projects, reading, field work, and other student activities.

Seventeen secondary schools cooperated in the project. Public high schools included Cincinnati, Ohio; the James Ford Rhodes and John Marshall High Schools in Cleveland, Ohio; Des Moines, Iowa, High Schools; Edwin Denby High School, Detroit, Michigan; Glens Falls, New York, High School; George Rogers Clark High, Hammond, Indiana; Arsenal Technical Schools, Indianapolis, Indiana; Susan Miller Dorsey High School, Los Angeles, California; The Bronx High School of Science, New York, New York; Oak Park and River Forest High School, Oak Park, Illinois; Olney High School, Philadelphia, Pennsylvania; Central High School, Trenton, New Jersey; New Trier High School, Winnetka, Illinois; Crawford School for Boys, Bloomfield Hills, Michigan; Colorado State College of Education High School, Greeley, Colorado; Fieldston Ethical Culture School, New York, New York; and the Lincoln High School of Teachers College, Columbia University. Staff members and research associates cooperating are listed in the appendix.

Research included the study of school communities and the uses of community resources; the study of young people and their needs; the study of current educational, social, health, economic, and science problems; the development of new courses within science departments; the study of human growth and development; the evaluation of teaching practices in secondary science.

Altogether this is the most significant, thorough, and extensive study that has been made in the teaching of science in the secondary schools. The experiences should be of great value to all research workers in secondary education who are primarily interested in improving and evaluating the secondary school teachings. Progressive science teachers everywhere will find in this book and other published reports of the Bureau much that significantly relates to their teaching and its possible improvement.

LAMPKIN, RICHARD H. *Variability in Recognizing Scientific Inquiry.* New York: Bureau of Publications, Teachers College, Columbia University, 1949. 61 p.

The ability to use the methods of scientific inquiry has been widely recognized as a proper and desirable objective of science instruction. Lampkin produces considerable evidence to show that one of our most important tools in instruction has been, and is, the science textbook. Since the textbook is widely used as a tool of instruction, it would seem important to gain some concept of how the various textbooks recognize and attempt to meet this objective.

Twelve representative textbooks equally divided among the subject matter fields of general science, chemistry, physics and biology were chosen for

analysis. Each was dismembered into 48 equal fragments and reassembled into twelve composite books. Each of the twelve composite books was arranged to contain a fragment from each quarter of each of the original textbooks. In addition, in order to check on the reliability of the readers, each composite book contained a common fragment from Bayles and Burnett's *Biology for Better Living*. This common fragment was then read and analyzed by all the readers as an integral part of the composite textbooks and served as a check upon variances in recognizing and identifying textbook materials related to the development of abilities to use the scientific method of inquiry.

Twelve highly selected readers were employed to read the twelve composite books and analyze them for materials pertaining to the scientific method of inquiry. Six of the readers were specialists in field of science education, while the other six were graduate students in a department of philosophy. It was assumed that all of the readers had had considerable contact with the methods of scientific inquiry.

The readers were given a carefully prepared analysis of the scientific method of inquiry which stated various aspects of the scientific method and assigned rubrics to the different steps or elements. The reader's task then became, first, recognizing textbook subject matter that pertained to the scientific method of inquiry and, second, deciding which part of the "Elements of the Scientific Method" was being treated and assigning the proper rubric. In order to check on the reader's ability to decide which portion of the method of inquiry was being treated by a given textbook statement, they were given a comprehensive pretest. The test was composed of sixty statements, all of which were pertinent to some portion of the scientific method each of the sixty statements was believed related.

The analyses of the work done by the readers on these sixty statements and on the common fragment were the most interesting results of the study. To determine the amount of agreement in bracketing, a carefully designed procedure was followed. If all twelve of the readers agreed either to bracket or not to bracket a passage, an "Extensional Agreement Index" of +1.000 was accorded that passage. If half the readers agreed to bracket and half the readers agreed not to, the passage was accorded an E.A.I. of 0.000.

On all the passages in the common fragment, the mean extensional agreement was found to be less than one-third. On the common fragment and again on the sixty passages that had been preselected as pertaining to the scientific method of inquiry, there was very little agreement as to which part of the scientific method was being treated. On the sixty pre-selected passages alone, this very able group of readers had a mean score of only a little more than half the possible. In brief, a great variability was discovered among the readers as to what was considered to be textbook material pertinent to the scientific method and also as to what part of the scientific method it applied.

This reader variability forced Lampkin to abandon an attempt to get answers to questions concerning the methods employed by textbooks in presenting scientific inquiry, and the frequency that illustrations, project materials and suggested exercises are used as a means of developing abilities to use the scientific method. He did find that the mean space per book bracketed by the readers was little more than ten per cent. However, the great value of this study may very well be found in its unwritten implications and in the questions that it raises that are still unanswered. Does the scientific method of inquiry have basically a different meaning for different individuals to a much greater degree than has heretofore been suspected? If a group of highly selected readers, supposedly having had considerable training in the methods of science, are unable to recognize and identify the elements of this method, can we expect good results from our science students in developing abilities to use this method while using the very same textbook materials? What role does reader projection play in reading or studying a textbook? Do these results mean that the teacher and textbook writer must make an even greater effort to understand and know the students with whom they are concerned? Or, does it say that texts and textbook materials do not and cannot present the scientific method satisfactorily? As can be seen, a study such as this does force us to reëxamine and reappraise many of our accepted assumptions in light of the apparent wide reader variability. It may suggest considerations that have, to a large extent, been ignored in seeking ways to develop abilities to use the methods of scientific inquiry. It is a valuable study in an area where our knowledge is much too incomplete. WILLARD J. JACOBSON

COMMITTEE ON THE METRIC SYSTEM. *The Metric System of Weights and Measures.* New York: Bureau of Publications, Teachers College, Columbia University, 1948. 303 p. $3.00.

This is the Twentieth Yearbook of the National Council of Teachers of Mathematics. It supplies a comprehensive view of metric usage at the present time as reported by some sixty individuals and numerous organized groups in widely varied fields. It surveys the history, nature, and advantages of the metric system and offers specific programs for its adoption both in general use and in the classroom throughout the United States and the British Empire which alone in the civilized world have not yet made this change to uniform and integrated weights and measures.

The metric system has made increasingly important contributions to all activities involving measurement in science, commerce, industry, education, military science, sports, and daily life. Its simple and integrated decimal relationships make possible clearer visualization of measurements, greater speed and accuracy in computation, and freer interchange of knowledge as well as of manufactured products through the use of uniform units. In the field of education alone one year of school time could be saved for each child

by substitution of the metric system for the traditional heterogeneous measures.

Only tradition and a fear of changing to the new prevents this much more logical and practical system of measurement from being put into immediate effect. It would be difficult to present a better case for an immediate change. Both science and mathematics teachers will find this a most interesting and practical book for their classroom use.

CURTIS, FRANCIS D. AND URBAN, JOHN. *Biology in Daily Life.* Boston: Ginn and Company, 1949. 608 p. $3.60.

Biology in Daily Life is an outstanding book by whatever standard it may be compared. Seemingly it should set the pace for all future science textbook writers in the secondary field. From the student standpoint it should be most appealing and challenging. The literary style is most readable—clear and understandable. The illustrations and photographs are unequalled in any secondary biology text.

The authors state that the three objectives of high school biology are: (1) to develop functional understandings of biological principles; (2) to develop scientific attitudes; and (3) to develop an understanding of the importance of the scientific method and facility in its use. The authors further state that these objectives can be substantially achieved only when specific materials specially designed to effect them are taught directly, and that they are not attained to any appreciable extent incidentally or as an inevitable concomitant of studying subject matter.

Specific attention has been paid to such student aspects as reading comprehension, adjustment to individual differences in pupils (through designating essential materials, through providing a varied program to stimulate reflective thinking, through refining the scientific vocabulary and through providing a varied and graded array of activities), adjustment to differences in classes, integration, and by numerous learning aids.

The content of the book has been determined in large part through research. Care was exercised to see that the content requirements of various states and city syllabuses were adequately met. The organization and methods of presentation are based on many years of teaching experience, supervising high-school classes in biology, and working with high school biology teachers.

There are eight units as follows: (1) problems and characteristics of living things; (2) using our biological resources wisely; (3) the world's food supply; (4) food and life; (5) the conquest of disease; (6) the behavior of living things; (7) life continues from age to age; and (8) kinds of life. Characteristics of the elements of scientific methods are listed under the title *As Scientists Work* and characteristics of scientific attitudes are listed under *As Scientists Think.* A wordbook, a teacher's manual and key, and tests to accompany the text may be had upon application.

Biology in Daily Life is a truly superior book that will have wide and extensive usage for many years to come.

CURTIS, FRANCIS D. *Workbook to Accompany Curtis and Urban's Biology in Daily Life.* Boston: Ginn and Company, 1949. 169 p. $0.88.

This workbook is intended to accompany the author's *Biology in Daily Life* reviewed above. Professor Curtis says a workbook should fill three functions: (1) it should furnish suggestions and directions for many and varied activities; (2) it should provide adequate facilities for recording students' experiences in connection with the course; and (3) it should supply study helps for improving the students' competency in mastering the subject matter of the course. Many varied activities are provided: experiments, projects, things to do at home, study and review guides, test questions, specific, simple statements regarding the development of scientific method and scientific attitudes. Especially attention was paid to changes brought about in curricula, in students, and in teachers.

BRANDWEIN, PAUL F., HOLLINGSWORTH, LELAND G., BECK, ALFRED D., AND BURGESS, ANNA E. *Science for Better Living.* New York: Harcourt, Brace and Company, 1950. 643 p. $3.28.

Science for Better Living is a full-year, complete course in general science for the eighth and ninth grade. The authors state the central theme as: How scientists in all fields; using the same scientific methods, are working cooperatively to help solve fundamental problems of human living.

The literary style and vocabulary are within the reading level of the average eighth and ninth grader. There are short, direct sentences with full, clear explanations. Technical terms are limited to 550. Experiments are "built into" the text so that they may either be performed in class or else read and discussed as part of the assignment.

No attempt is made to include all areas of science but rather to limit content and discuss each topic thoroughly. As the authors put it "This is *not* a jam-packed catalogue of scientific facts." There are eight units: Man—The Basic Resource; Exploring the Earth; Understanding the Earth's Weather; Investigating the Earth's Storehouse; Improving Biologic Production; Doing the World's Work; Strengthening the World's Communication; and Increasing Man's Life Span.

There are 405 photographs, charts, diagrams, and illustrations. Each unit has an introduction, and many experiments with each chapter having a "Going Farther" supplement. The latter consists of experiments, vocabulary lists, thinking exercises, self-tests, suggested additional reading, and so on. Altogether this is one of the finest general science texts that has been published.

The authors are well-known science teachers with many years teaching experience. Dr. Paul F. Brandwein is chairman of the Science Depart-

ment of the Forest Hills High School, Forest Hills, New York. Mr. Leland G. Hollingsworth is Director of Science in the Brookline Public Schools, Brookline, Massachusetts. Dr. Alfred D. Beck is Science Supervisor of the Junior High School Division for the New York City Board of Education. Miss Anna E. Burgess is Directing Principal and Formerly Supervisor of Elementary Science for the Cleveland, Ohio, Board of Education.

BLACKWOOD, PAUL E. *Experience in Science.* New York: Harcourt, Brace and Company, 1950. 156 p. $1.20.

Experiences in Science is a workbook to accompany *Science for Better Living* reviewed above. There are 34 exercises distributed among the eight units. A variety of learning activities is provided. Pages are detachable. Altogether this seems to be an unusually fine workbook.

The author, Mr. Paul E. Blackwood is Specialist for Elementary Science, U. S. Office of Education.

EBY, GEORGE S., WAUGH, CHARLES L., WELCH, HERBERT E. AND BUCKINGHAM, BURDETTE H. *The Physical Sciences.* Boston: Ginn and Company, 1950. 536 p. $3.36.

This is the revised edition of a high school text first published in 1943. It is supposed to be used following courses in general science and to replace courses in physics and chemistry. In content it is similar to college texts in survey courses in physical sciences. This book is designed to meet a trend in secondary science sequence.

There are nineteen chapters divided into four units: (1) sun and stars; (2) earth sciences; (3) physics that all should know; and (4) chemistry that all should know. A few typical chapter headings are: island universes, formation of the earth, weather, our mechanical helpers, science in communications, chemical industries, and chemistry and life.

Altogether the selection and treatment of content is quite sound. Seemingly it would most adequately meet the needs of especially smaller high schools where the pupils cannot take both physics and chemistry courses.

HURD, ARCHER W. *Factors Influencing Student Success in Medical Education.* Richmond, Virginia: Bureau of Educational Research and Service, Medical College of Virginia, 1950. Unpaged. $1.75.

The studies included in this volume are continuation of ones made earlier and published in *Problems of College Success or Failure.* The freshmen of the earlier study are the sophomores of the present study. It is planned to follow this study with studies of the same students when they are juniors and later seniors.

Not only should this study be of special significance in the field of medical education but also have important implications for prospective public school teachers.

Catalogue studies, case studies, interviews, surveys, and tests are some of the techniques described in this study. It gives every evidence of thorough, scholarly, resourceful investigation. Statistical procedures have been applied whenever practical and advisable. A duplicate study in the training of teachers would be of great significance in the development of better teacher-training curricula and techniques. It would also be of great service in the selection of better prospective teachers.

EBY, GEORGE S., WAUGH, CHARLES L., AND WELCH, HERBERT E. *Laboratory Guide for the Physical Sciences.* Boston: Ginn and Company, 1950. 164 p. $1.28.

This laboratory guide is designed to accompany the authors' *The Physical Sciences* reviewed above. A total of one hundred thirty-one experiments and activities are listed. This enables the teacher and student to make a wide selection of those activities better suited and more interesting to them.

Educator's Guide to Free Films. Randolph, Wisconsin: Education Progress Service, 1949. 355 p. $5.00.

A complete, up-to-date, annotated schedule of free films. This is the 9th annual edition.

GRETA OPPE

HORKHEIMER, MARY F. AND DIFFOR, JOHN W. *Educators Guide to Free Slidefilms.* Randolph, Wisconsin: Educators Progress Service, 1949. 114 p. $3.00.

This is the first annual edition of the *Guide to Free Slidefilms.* It marks the beginning of a new service devoted exclusively to free slidefilms and free slides. It brings to the notice of classroom teachers over 19,000 frames or separate pictures.

GRETA OPPE

FOWLKES, JOHN GUY AND MORGAN, DONALD A. *Elementary Teachers Guide to Free Curriculum Materials.* Randolph, Wisconsin: Educators Progress Service, 1949. 348 p. $4.50.

This sixth annual edition of the *Elementary Teachers Guide to Free Curriculum Materials* is completely revised. New titles are starred and a new feature of this edition is a subject index constituting a major addition to its service. Some of the fields covered by the guide are: audio-visual aids, air-age education, clubs and scouting, conservation, guidance, health and physical education, industrial arts and home economics, language arts, science, and social studies.

GRETA OPPE

JAHN, T. L. AND JAHN, FRANCES F. *How to Know the Protozoa.* Dubuque, Iowa: Wm. C. Brown Company, 1950. $3.00.

Here is a pictured key for identifying the more common fresh water, marine, and parasitic Protozoa with elementary discussions of the importance of each group and interesting facts concerning them. There are 354 figures and a pictured glossary and index. The style is informal and can

be assimilated by both the advanced student and less advanced student of protozoology.

GRETA OPPE

How to Become a Radio Amateur. West Hartford, Conn.: American Radio Relay League, 1950. 70 p. $0.50.

This is a complete beginner's guide to the hobby of amateur radio—what amateur radio offers from message handling to building a station.

GRETA OPPE

DIETRICH, HAROLD G. AND KELSEY, ERWIN B. *Exercises in General Chemistry.* New York: The Macmillan Company, 1950. 285 p. $3.00.

These 43 experiments at the college level are preceded by factual material on which the student may base his reasoning and write his record. The right hand page of the manual has been left blank so that the student may organize his facts and interpret his observations in a clear, concise report.

GRETA OPPE

CASE, EARL C. AND BERGSMARK, DANIEL R. *Modern World Geography.* Chicago: J. B. Lippincott, 1949. 746 p.

The study of the relationship between human action and the natural environment as the heart of geography is the point of view of the authors of this revised world geography. The authors have given great care to the selection of material to prove and to point out this relationship. The United States is given major attention, but careful attention has been given to foreign lands and their importance to human well being.

GRETA OPPE

MALM, LLOYD E. AND FRANTZ, HARPER W. *College Chemistry in the Laboratory.* San Francisco: W. H. Freeman Company, 1950. 331 p.

College Chemistry in the Laboratory is a laboratory manual designed to accompany Pauling's College Chemistry. There is constant emphasis throughout the manual on the observance of safety. Laboratory techniques are illustrated by numerous drawings. There are 46 experiments in the manual.

GRETA OPPE

WHYTE, L. L. *The Next Development of Man.* New York: The New American Library, 1950. 251 p. $0.35.

Lancelot Law Whyte calmly and confidently in this book expresses his belief that the future of civilization depends upon the development of a "unitary man" and predicts a vista of tremendous vision. What are the characteristics of such a world trend? A single order, balanced and universal from unrestricted expansion towards finite order, a recognition of interdependence in the world system, spread of unitary conviction, development of unitary science, operation of the social hierarchy of power and skills in the interests of general development. The author emphasizes that the most important trend is the industrial development of Asia and the rapid raising towards Western standards of the Asiatic half of the world. He believes the cruder contrasts of East and West will disappear but their diversity will remain. His analysis of the social structure of four important nations, Great Britain, Germany, the United States and Russia and the opportunity to share in this transformation and total development of society is a challenge to the nations. "The half century ahead is the epoch of the rise of Asia, but it is primarily America as the dominant power that must accept and facilitate this peaceful development if the two hemispheres are not to fall into conflict."

GRETA OPPE

FERNELIUS, W. CONRAD, GARRETT, ALFRED BENJAMIN, AND QUILL, LAURENCE L. *Fundamentals In Chemistry for the Laboratory.* Boston: Ginn and Company, 1950. 367 p.

This newly revised manual provides an excellent number of laboratory experiments for an introductory course in chemistry. The choice of experiments has been governed by these two objectives: 1) to present the principles of chemistry and 2) to create an awareness of our chemical environment.

GRETA OPPE

COURCHAINE, ARMAND JOSEPH. *Simplified Chemistry Experiments.* New York: G. P. Putnam's Sons, 1950. 234 p.

This manual is for use with any standard text in inorganic, organic, and physiological chemistry. Its viewpoint is more or less of a biochemist and appears to be an excellent manual for teaching chemistry to student nurses.

GRETA OPPE

SISLER, HARRY H. AND STEWART, JAY J. *A Systematic Laboratory Course in General Chemistry.* New York: The Macmillan Company, 1950. 396 p. $3.00.

The authors of this chemistry manual believe that a laboratory course in general chemistry should make a considerable contribution to the realization of these two objectives: 1) to enlarge the student's understanding of the physical world and 2) to develop his ability to apply the scientific method to technical and chemical problems; therefore they have provided experiments to stimulate thought. The manual is thorough and up-to-date.

GRETA OPPE

DU SHANE, CARL GRAHAM AND REGNERY, DAVID. *Experiments in General Biology.* San Francisco: W. H. Freeman Company, 1950. 182 p.

This laboratory manual in general biology is divided into five parts: Introduction to laboratory work, Structure and function of plants, Kinds of animals, Structure and functions of vertebrates, Genetic ecology and evolution. The illustrations really illustrate the work of the laboratory and biological techniques.

GRETA OPPE

ECKERT, THEODORE AND OTHERS. *Discovery problems in General Science.* New York: College Entrance Book Company, 1950. 284 p. $0.90.

This is a workbook for ninth grade general science. Its organization reflects the trend in recent textbooks and courses of study. A humorous cartoon to introduce and motivate the unit is effectively employed. There are plenty of simple demonstrations and activities. There are many illustrations in color. GRETA OPPE

GILMAN, PHIL R. AND PETERSON, VINCENT R. *Biology in Review.* Chicago: Lyons and Carnaham, 1949. 405 p.

This handbook is an excellent guide for the study of biology. There are fourteen units beginning with living cells and interrelationships and ending with conservation and distribution limitations covering both the plant and animal kingdoms. Each of the units has the more modern teaching devices to stimulate thinking such as, "Some Things You Should Know," Key Words, "A Test Yourself Experiment."

GRETA OPPE

BAWDEN, ARTHUR TALBOT. *Man's Physical Universe.* New York: The Macmillan Company, 1950. 822 p. $4.75.

This is the third edition of survey textbook of physical sciences for colleges. Physical science teachers who emphasize the importance of both information and development of scientific attitudes will find this book either an excellent text or reference. Some teachers will like its systematic and functional approach. To that seemingly growing school of thought who disdain anything remotely resembling a functional approach in the teaching of physical science courses as a phase of general education, this textbook would be not only useless but positively harmful.

ETKIN, WILLIAM. *College Biology.* New York: Thomas Y. Crowell Company, 1950. 806 p.

College Biology is based on the following important points: 1. emphasis on basic concepts, 2. requirements of laboratory instruction, 3. motivation of students, 4. development of scientific thinking, 5. need for student aids, and 6. provision for the gifted student.

The treatment of various phases of physiology, botany, and zoology seem quite adequate. Numerous illustrations and photographs supplement the textual material. Altogether it seems to be an excellent biology text which would also serve as a valuable reference for the high school biology teacher.

MOMENT, GAIRDNER B. *General Biology.* New York: Appleton-Century-Crofts, Inc., 1950. 680 p. $5.00.

This is the second edition of a text first published in 1942. The author states that "emphasis is placed on key principles and central concepts and on the evidence supporting them." Whenever possible biological discoveries are presented with historical perspective. Some 150 new illustrations have been added to this revised edition. There is increased stress placed on the human import of biological facts and principles.

The content would seem most adequate to meet the needs of college students taking college biology. The text would serve excellently as a reference in those courses using some other basic text, or not using any basic text at all. High school biology teachers, too, would find it an excellent reference for their courses.

VILLEE, CLAUDE A. *Biology: The Human Approach.* Philadelphia: W. B. Saunders Company, 1950. 580 p. $5.00.

This general biology text is an outgrowth of the author's experience in teaching a course in Human Biology at the University of North Carolina. He is now at Harvard University. Emphasis has been placed on the comparative and evolutionary aspects of biology and on the physiological and chemical aspects of life. The author believes that the parts of biology most interesting to a beginning student and most useful as a part of general education are those that explain how organisms, particularly human beings, function and how they came to stay that way. This text would serve excellently for use in college survey courses in biology and as a reference in high school biology courses.

ROBBINS, WILFRED W. AND WEIER, T. ELLIOT. *Botany: An Introduction to Plant Science.* New York: John Wiley & Sons, Inc., 1950. 480 p. $5.00.

This text covers the basic facts of plant science and how they affect agriculture, medicine, and many other fields. Nearly 500 illustrations help to clarify important points of theory and structure. Each page is set in a double-column type of column. Altogether this seems to be an unusually fine text in Botany. A high school biology teacher would find it an excellent reference.

GIBBS, R. DARNLEY. *Botany: An Evolutionary Approach.* Philadelphia: The Blakiston Company, 1950. 554 p. $6.00.

This text features the classical approach to the subject. The author follows the sequence of evolution from the simplest to the complex, rather than beginning with familiar plants. There are 261 illustrations and 118 plates. The author is Professor of Botany at McGill University, Montreal.

COURCHAINE, ARMAND JOSEPH. *Chemistry Visualized and Applied.* New York: G. P. Putnam's Sons, 1950. 687 p. $5.50.

According to the author "This book is an outgrowth of teaching experience, and one of its chief aims is to demonstrate that chemistry is not as difficult a science as many students are inclined to believe. To help accomplish this purpose a great deal of the material discussed has been illustrated with schematic drawings or photo-

graphs. The book attempts, by means of illustrations, to serve the needs of two types of students, the visual thinker and the abstract thinker." In addition to the numerous illustrations, this college text has a list of introductory questions at the beginning of each chapter with test questions and references at the end of the chapters.

DAY, ALLAN R. *Electronic Mechanisms of Organic Reactions.* New York: American Book Company, 1950. 314 p. $3.50.

This book represents an attempt to systematize organic chemistry through the use of electronic mechanisms.

PARTINGTON, J. R. *A Textbook of Inorganic Chemistry.* New York: The Macmillan Company, 1950. 996 p. $3.75.

This is the sixth edition of a text first published in 1921. This edition has been almost completely rewritten, yet it continues most of the traditions of the earlier editions. Typically English in literary style, the book presents a sound, fundamental course in chemistry. The author is a professor in Queen Mary College of the University of London.

WHITEHEAD, THOMAS H. *Theory of Elementary Chemical Analysis.* Boston: Ginn and Company, 1950. 233 p. $2.75.

This book presents the theoretical principles upon which any scheme of inorganic analysis is based with sufficient details so that each student gets a thorough understanding of each principle.

PAULING, LINUS. *College Chemistry.* San Francisco: W. H. Freeman and Company, 1950. 705 p. $4.50.

College Chemistry was written for use by students planning to major in chemistry and related fields and others who have a primary interest in other subjects, including some who have not had high school chemistry. Molecular and atomic structure are taken up early in the course.

STEINBACH, OTTO F. AND KING, CECIL V. *Experiments in Physical Chemistry.* New York: American Book Company, 1950. 249 p. $3.50.

The authors of *Experiments in Physical Chemistry* have attempted to make the experiments as simple and inexpensive as possible, keeping in mind the practical requirements of the laboratory and the diversified needs of students.

CONANT, JAMES BRYANT AND BLATT, ALBERT HAROLD. *Fundamentals of Organic Chemistry.* New York: The Macmillan Company, 1950. 413 p. $4.00.

This is a brief course for students concerned with biology, medicine, agriculture, and industry but who do not plan to become professional chemists. For them many of the special methods and factual details are not essential. Biochemistry receives a great deal of emphasis.

BRAY, WILLIAM C., LATIMER, WENDELL M. AND POWELL, RICHARD E. *A Course in General Chemistry: Semi-Micro Alternate Form.* New York: The Macmillan Company, 1950. 217 p. $3.00.

This third edition of a text first published in 1923 is based on over thirty-six years experimentation at the University of California on the problems of teaching the principles of general inorganic chemistry.

SMITH, SYLVANUS J. *Advanced Chemical Calculations.* New York: The Macmillan Company, 1950. 454 p. $2.75.

Advanced Chemical Calculations is a text to be used in advanced courses in chemistry following general, physical, qualitative, and organic chemistry.

BULLOUGH, W. S. *Practical Invertebrate Anatomy.* New York: The Macmillan Company, 1950. 463 p. $4.50.

This is a series of brief, practical descriptions of the structure of more than one hundred invertebrate animals commonly dissected by advanced students of zoology.

HEISIG, G. B. *Semimicro Qualitative Analysis.* Philadelphia: W. B. Saunders Company, 1950. 356 p. $3.50.

This is the second edition of a text first published in 1943. Theory has been brought up to date. The last two thirds of the book is experimental.

CURTMAN, LOUIS J. *Introduction to Semimicro Qualitative Chemical Analysis.* New York: The Macmillan Company, 1950. 391 p. $3.50.

This is the revised edition of a text first published in 1942. The first half of the book pertains to theory and calculations in semimicro methods.

MONNETT, VICTOR E. AND BROWN, HOWARD E. *The Principles of Physical Geology.* Boston: Ginn and Company, 1950. 450 p. $4.50.

Here is a concise text in geology that should serve excellently to meet the needs of both general students and geology majors.

The literary style is clear and direct. The content seems to be well selected and the photographs and illustrations are unusually good. Altogether it is a text that should be much more interesting and challenging to the student than the usual college text in geology.

SLURZBURG, MORRIS AND OSTERHELD, WILLIAM. *Essentials of Electricity for Radio and Television.* New York: McGraw-Hill Book Company, 1950. 533 p. $4.00.

This new book is a revision of the author's successful *Electrical Essentials of Radio.* Electrical principles are presented in terms of electron flow. Much new material has been added to this new edition and other material has been brought up to date when necessary. The authors are instructors in the Wm. L. Dickinson High School, Jersey City, New Jersey.

STEWART, OSCAR AND GINGRICH, NEWELL S. *Physics.* Boston: Ginn and Company, 1950. 726 p. $5.00.

This fifth edition of a well-known college text has been rewritten by Professor Gingrich. Especial attention has been paid to a pedagogical approach. The wide usage of the earlier editions attests to the popularity of such an approach.

GILBERT, NORMAN E. *Electricity and Magnetism.* New York: The Macmillan Company, 1950. 569 p. $5.00.

This is the third edition of a text first published in 1932. It emphasizes both theory and applications. Its use would follow courses in general physics.

FRANK, NATHANIEL H. *Introduction to Electricity and Optics.* New York: McGraw-Hill Book Company, 1950. 440 p. $5.00.

This is the second edition of a book first published in 1940. It is intended to follow the course in general physics. Emphasis is on principles and physical thinking underlying the subjects of electromagnetism and optics.

BROWN, JR. F. A. (Editor). *Selected Invertebrate Types.* New York: John Wiley & Sons, Inc., 1950. 597 p. $6.00.

Selected Invertebrate Types was written by a group of 13 expert zoologists, most of them members of the Department of Invertebrate Zoology, Marine Biological Laboratory, Woods Hole, Massachusetts. It is written chiefly as a laboratory manual and covers the anatomy and physiology of more than 100 commonly used American species.

BRAGG, ARTHUR N., WEESE, A. O., DUNDEE, HAROLD A., FISHER, HELEN TALLEY, RICHARDS, A. AND CLARK, CAROL BERGTHOLD. *Researches on the Amphibia of Oklahoma.* Norman, Oklahoma: University of Oklahoma Press, 1950. 154 p. $1.00.

This is a series of research papers on the amphibia of Oklahoma.

BALES, ROBERT F. *Interaction Process Analysis.* Cambridge, Massachusetts: Addison-Wesley Press, Inc., 1950. 203 p. $6.00.

A method for the study of social groups is described. The theoretical framework of the technique is described at some length. Two chapters are devoted to training observers and appraising observer reliability. More than sixty pages are devoted to analysis and interpretation.

KERSHNER, R. B. AND WILCOX, L. R. *The Anatomy of Mathematics.* New York: The Ronald Press Company, 1950. 416 p. $6.00.

This is the treatise on the axiomatic method. The axiomatic method is presented primarily by example. Pencil-pushing is put to a minimum. The authors state that "The only prerequisites for reading this book are the desire to start and the perserverance to finish. The reader does not even need to know the sum of 7 and 5; incidentally, if he does not know this sum, he will learn it from this book." Prospective teachers of mathematics in high school and college and graduate students in mathematics should find the book interesting and useful.

DADOURIAN, H. M. *Plane Trigonometry with Tables.* Cambridge, Massachusetts: Addison-Wesley Press, Inc., 1950. 84 p. $3.00.

This is a college text in plane trigonometry that emphasizes concepts, principles, and general methods. The approach is functional.

CALVERT, ROBERT. *Patent Practice and Management for Inventors and Executives.* Scarsdale, New York: Scarsdale Press, 1950. 371 p. $5.00.

This book describes the process of obtaining patents, using them and administering the patent policy to stimulate research, invention, and morale. It is a practical book and the author has discarded the procedure of abstracting court cases and reviewing the decisions. It is a most readable book having a clearness of style that holds the reader's interest.

WINGE, OJVIND. *Inheritance of Dogs.* Ithaca, New York: Comstock Publishing Company, 1950. 153 p. $3.50.

Geneticists and dog breeders will welcome this first English translation of Dr. Winge's important work. The mechanics of inheritance are explained in terms which the layman can understand. Biology teachers will find many practical and specific examples of inheritance suitable for classroom illustrations.

RUSSELL, SIR E. J. *Lessons on Soil.* Cambridge, England: The University Press, 1950. 134 p.

The author of *Lessons on Soil* is President of the British Association and late Director of the Rothamsted Experimental Station at Harpenden. Europeans are admittedly ahead of Americans in soil usage and conservation. Probably no other problem is of greater significance to the human race than soil conservation. Hence this book by an authority in the field should be especially opportune for those living on the western shores of the Atlantic. There are 70 illustrations and photographs.

DUNCAN, WINIFRED. *The Private Life of the Protozoa.* New York: The Ronald Press Company, 1950. 141 p. $3.00.

The life cycles of amoebas and other protozoa, of the flatworms, snails and other metazoa, and of insect larvae are presented in an unusually charming way. It is an excellent book for the biology teacher and the beginning biology student. Many biologists will remember the author's earlier equally delightful book *Webs in the Wind* on the habits of web-weaving spiders.

GRANT, LESTER. *The Challenge of Cancer.* Washington, D.C.: Superintendent of Documents, 1950. 116 p. $0.55.

The fifteen articles forming the basis of this book are used by special permission of the New York Herald Tribune, copyright owner. These have been revised and four new chapters added by the author in collaboration with staff members of the National Cancer Institute.

Altogether this is an unusually fine publication, bringing all present knowledge known about cancer up to date.

There is a *Teaching Guide* to accompany *The Challenge of Cancer.*

MCGUIRE, JOHN M. AND BARLOW, HOWARD W. *An Introduction to the Engineering Profession.* Cambridge, Massachusetts: Addison-Wesley Press, Inc., 1950. 207 p. $3.50.

This is a survey of the principal fields and branches of engineering. It could serve excellently as a textbook in courses which introduce the college student to the profession of engineering. High school guidance teachers and high school students seriously considering the profession of engineering as a vocation will find it an unusually fine source of information. It answers such questions as "What does one do?" and "What are the qualifications?" In a general way it answers the questions, "What are the prospects for the future in this field?"

HEINLEIN, ROBERT. *Farmer in the Sky.* New York: Charles Scribner's Sons, 1950. 216 p. $2.50.

This is a science fiction story that will appeal to boys of the junior-senior high school age. In recent years science fiction of both the magazine and book type has come to have a much more important place in the reading habits of Americans, both adults and youth. Often the fictionalized material of a predictive nature has proven so nearly to be factual that it has seemed uncanny.

This is the adventure story of the space journey of one family and especially the son Bill to the third moon of Jupiter called Ganymede. The two months' time spent in the spaceship *Mayflower* is described in detail. Ganymede is being colonized from Earth's great overflow population. Pioneer life and conditions in Ganymede make up the major portion of the book.

Scientific allusions are said to be as accurate as can be ascertained. Heinlein was trained at Annapolis and had service in the Navy.

WILSON, CHARLES G. *The Winds Blow Free.* New York: Ives Washburn, Inc., 1950. 199 p. $2.50.

This is a story of the American Revolution, based on authentic records of the first American Navy. Boys and girls of junior high and senior high school age will enjoy this story if they are at all interested in historical fictional adventure stories.

SHAPLEY, HARLOW, WRIGHT, HELEN, AND RAPPORT, SAMUEL (Editors). *Readings in the Physical Sciences.* New York: Appleton-Century-Crofts, Inc., 1948. 501 p. $3.00.

This is a collection of readings for the layman and the student in general college physical science courses. The articles were so selected and organized to make four approaches to the problems of science: (1) Historical, (2) Scientific Method and Its Implications, (3) Research, and (4) Tools and Apparatus. The articles are grouped under the following headings: (1) Science and the Scientific Method, (2) Astronomy, (3) Geology, (4) Mathematics, (5) Physics, and (6) Chemistry.

Many well known writers and great scientists are represented. A few of these are: *A Theory that the Earth Moves Around the Sun* by Nicholas Copernicus, *Proof that the Earth Moves* by Galileo Galilei, *Is There Life on Other Worlds?* by Sir James Jeans, *Weighing the Earth* by Paul R. Heyl, *Mathematical Creation* by Henri Poincare, *Discoveries* by Sir Isaac Newton, *Electrical Experiments* by Benjamin Franklin, and *Combustion* by James R. Conant.

SCIENCE CLUBS OF AMERICA. *Sponsor Handbook.* Washington, D. C.: Science Service, 1719 N Street N.W., 1950. 110 p. $1.00.

Every science club sponsor should have a copy of this book as a "must." It has much valuable material for those not sponsoring science clubs, whether they teach general science, biology, physics, or chemistry. A copy of this book may so enthuse the science teachers as to make them want to start a science club immediately as a valuable adjunct to their regular classroom teaching. It will be easy to initiate a science club with this handbook. There is an excellent list of recommended books for science clubs (30 pages of titles!) and the same number of pages listing free and low cost materials for clubs (and science teachers!).

HUXLEY, JULIAN. *Heredity: East and West, Lysenko and World Science.* New York: Henry Schuman, Inc., Publishers, 1949. 246 p. $3.00.

In recent months Trofim Lysenko, a Russian geneticist, has become the storm center of the scientific world. The bitter controversy aroused by his views on heredity clearly demonstrates that science, as well as political and social theory, is a battleground in the cold war between the West and the East. Scientists outside the Iron Curtain have fiercely attacked the Soviet Union for adopting Lysenkoism as official, party-line genetics.

In terms clearly understood by the layman Huxley explains the conflict between Mendelian and Lysenkoist genetics. Huxley states that Lysenko and his followers are not scientific in any proper sense of the word—they do not adhere to recognized scientific method, or employ normal scientific precautions, or publish their results in

a way which renders their scientific evaluation possible. They move in a different world of *ideas* from that of professional scientists, and do not carry on discussion in a scientific way. . . . Meanwhile Lysenko's alleged results are suspect because of his faulty methods. . . . In any event . . . the major issue at stake was not the truth or falsity of Lysenko's claims, but the overriding of science by ideological and political authority. . . .

If *scientific thought* and achievement can be advanced only by employment of the scientific method, possibly the Western World is the real gainer in the Soviet policy regarding scientific advancement—the less *they find out* the more the gains of the Western World in this *Ideological War*.

ROGERS, STANLEY. *It Took Courage: Tales of Adventurous Discovery*. New York: Holiday House, 1948. 268 p. $3.00.

True tales of heroic exploit by men of science, stamina and imagination, are related. Many of the stories begin where many tales end and the author tells how the truth was found out about what happened to many exploring expeditions that failed to return. For example the first tale is how the fate of Andree, the Swedish explorer who tried to discover the North Pole in a curious balloon in 1897. The mystery of exactly what happened to the three men in the balloon was not solved until thirty-three years later.

Then follows the stories of two successful attempts to find gold in ships that went down at sea, the search by Franklin who attempted to find the Northwest passage, discoveries in caves, Stanley's finding of Livingstone, lost ships in the South Pacific, discoveries in Egypt, the buried cities of Troy and Nineveh, the search for dinosaur remains, and the battle for magic drugs.

The stories are interesting, many of them having a scientific slant. It is an excellent supplementary reading book for high school boys and girls. Adults will enjoy the book, too.

LEYSON, CAPTAIN BURR W. *Modern Wonders and How They Work*. New York: E. P. Dutton and Company, 1949. 216 p. $3.50.

Many recent wartime and post wartime scientific wonders are described in simple, non-technical style. In several instances certain phases of the workings of these wonders have only recently been released from wartime censorship. Many of these wonders are vital in our national defense. It is to be hoped that too much has not been released about these wonders. At any rate it is intensely interesting reading for laymen, junior high school and senior high school teachers, and for better secondary school pupils. It is a recommended book for the high school science library. Some of the descriptions are the best the reviewer has read.

The revolutionary developments in atomic fission, robot planes, radar, jet propulsion, and color television are interestingly described.

SESSLER, JACOB G. *Junior Nature Sermons*. New York: Fleming H. Revel Company, 1948. 124 p. $1.50.

This is a series of nature talks with a religious emphasis. The author sees the earth and its wonders as the working hands of God. He tells about birds, flowers, insects, trees, clouds, mountains, animals, the rain, and so on. In all of them he sees and emphasizes the handiwork of God. The author is a pastor and is noted for his children's sermons. Reminiscent of many of the science textbooks and writings of the nineteenth century, this book is different. Maybe we have gotten too far away from the religious bent of this earlier period! Have we become too materialistic?

CRAIGIE, DAVID. *The Voyage of the Luna I*. New York: Julius Messner, Inc., 1949. 252 p. $2.50.

Boys and girls who enjoy adventure stories will thrill in the reading of this breath taking story of Jane and Martin Ridley who stowaway on a rocket ship and land on the moon. Entirely fictional yet is just as imaginative and plausible as Jules Verne's *Twenty Thousand Leagues Under the Sea* or H. G. Well's *Voyage to the Moon*. Fictional science writing has become more popular in recent years and in some ways has taken on more of a cloak of respectability. Some science fiction has even come under the scrutiny of the F.B.I. This book may be classed as one of the better science fiction stories in the field. In fact much of the material is perfectly good science presented in a way to delight the boys and girls reading it.

EDITORS OF SCIENCE DIGEST. *The Science Digest Reader*. Chicago: Windsor Press, 1948. 310 p. $3.00.

This is a selection of outstanding articles published in *Science Digest* during the past ten years. Over seventy articles, what the Editors of *Science Digest* believe to be the best, are included. Every phase of science is included in this fascinating series of articles. The articles have a greater pertinency than that of the moment of publication. In a way, this compilation serves as a symbol of the best in science published during the decade beginning with the publication of *Science Digest* in 1937. This compilation marks a fitting celebration of ten years of a valuable service in science publication.

This is a valuable reference for the high school science book shelf and recommended reading for the science student and teacher, as well as the layman.

GILL, ROBERT S. *The Author, Publisher, Printer Complex*. Baltimore: The Williams and Wilkins Company, 1949. 144 p. $1.50.

The purpose of this book is to tell the author, particularly of scientific material, as simply as possible, what he needs to know in order to make the start a good one. About every aspect of pre-

paring and publishing a manuscript is described: the contrast between printing and publishing, the publisher's function, when is a manuscript publishable, the three stages of the printing process, suitable form, fair copy, references, legends, footnotes, quotations, permissions, corrections, illustrations, preface and foreword, table of contents index, galley proof, revision reprinting, literary property and inheritance, royalties and such.

The indicated scope of this book indicates that it is an excellent tool both to writers of magazine articles as well as textbooks and other publications.

CROWTHER, J. G., AND WHIDDINGTON, R. *Science At War.* New York: Philosophical Library, 1949. 195 p. $6.00.

This is the first detailed account of science's contribution to the war effort, based on the official archives and documents assembled by the Scientific Advisory Committee to the British Cabinet. Because of the close and intimate collaboration between the American and British forces during World War II, this volume is of great interest to laymen, science teachers, and others interested in science.

Among the basic topics considered are radar, the atomic bomb, operational research, and science and the sea. Almost a hundred graphs, drawings, and photographs illustrate the subject matter. The literary style and treatment is typically English. The book is very readable and non-mathematical.

STOUT, WESLEY W. *Secret.* Detroit: Chrysler Corporation, 1947. 67 p.

The text of *Secret* has been reviewed and permission for its publication given by the U. S. Army Corps of Engineers, for the War Department. It is a brief story of the work on nuclear research carried out during the war years. It is intended for the laymen but is especially recommended by the reviewer for elementary and secondary science teachers. Numerous photographs, many in color, supplement the textual material. Altogether it is one of the most readable accounts of nuclear energy and the results of the explosion of atomic bombs that has been printed.

DARROW, KARL K. *Atomic Energy.* New York: John Wiley and Sons, Inc., 1948. 80 p. $2.00.

This is a story of the development of nuclear physics—a story climaxed by the reality of atomic energy and the atomic bomb. This story comprises the four Norman Wait Harris lectures delivered at Northwestern University. Dr. Darrow is associated with the Bell Telephone Laboratories and is Secretary of the American Physical Society. He is author of *Introduction to Contemporary Physics* and *The Renaissance of Physics.*

The lectures are in a sense non-technical and almost non-mathematical. Educated laymen, science teachers and non-physicists and non-chemists can readily read and understand the lectures. Altogether Dr. Darrow has done an excellent job in popularizing nuclear energy without over-simplification and with the avoidance of inaccuracies for the sake of popularizing. It is an excellent book for the secondary chemistry or physics teacher, the better students in these courses, and the educated layman.

NININGER, H. H. *A Comet Strikes the Earth.* El Centro, California: Desert Press, Inc., 1946. 57 p.

The Barringer Crater near Winslow, Arizona, is one of the most impressive phenomena on the earth. Somewhere between 20,000 and 50,000 years ago, a comet struck the earth, displacing more than 300 million tons of solid rock, leaving a crater 570 feet deep and 4,200 feet in diameter. Pieces of meteoric material have been picked up in an area of about 100,000 acres surrounding the crater. Probably 15 to 20 tons of such material has been picked up, the largest piece being about 1,400 pounds. The major mass is believed to be imbedded in the southwest wall.

This little booklet discusses: The Earth Collides, A Meteorite Speaks, Puzzling Pits, Meteorite Showers, How to Recognize Meteorites, and Visitors from Space. Dr. Nininger, the author, is recognized as the world's foremost authority on meteorites. Attached to the booklet is a meteorite fragment found outside the rim of the Barringer Crater. Its authenticity is attested by Dr. Nininger.

MAYALL, R. NEWTON, AND MAYALL, MARGARET L. *Skyshooting.* New York: The Ronald Press Company, 1949. 174 p. $3.75.

Skyshooting is intended for anyone with a camera who wants some of the fun photographing the heavens. This is a book for the layman who would like to photograph flashing meteors, the mysterious aurora, the brilliant sun, the uncountable stars, the friendly moon, and the earth's companions—the planets. Much practical advice is given as well as interesting information about the various heavenly bodies. The book should have dual appeal to the photographer and the amateur astronomer.

EPSTEIN, SAMUEL, AND DE ARMOND, DAVID W. *How to Develop, Print, and Enlarge Pictures.* New York: Franklin Watts, Inc., 1947. 95 p.

This book shows you simple home methods, what equipment is needed, what chemical solutions are needed, how to make contact prints, how to make enlargements, and how to make equipment. There are 210 photographs describing every step of each process.

Altogether this book seems to be the most practical, usable book on developing, printing, and enlarging that reviewer has seen. It would seem to be excellent for the amateur in photography, the elementary, general science, and secondary teacher, as well as students in science and photography clubs.

QUARLES, GILFORD G. *Elementary Photography.* New York: McGraw-Hill Book Company, 1949. 345 p. $4.50.

This is the second edition of a book first published in 1948. Material has been brought up to date, a list of study questions have been added to the end of each chapter, and the chapters have been rearranged to give more practicality to the book. The treatment ranges between texts that are quite elementary and those that are quite technical. No previous knowledge of photography is assumed. It would seem to be an unusually good text for college course in beginning photography. On the other hand amateurs and classes or clubs in high school photography can gain much of value from following the many suggestions made.

EINSTEIN, ALBERT. *The World As I See It.* New York: Philosophical Library, 1949. 112 p. $2.75.

The World As I See It is an abridged translation of his earlier *Mein Weltbild.* However, it contains the essence of Einstein's philosophy and thinking and thus forms an important contribution by one of the foremost personalities of our times. Science teachers will find the translation readable, thought-provoking, challenging. In the beginning he answers the question as to the meaning of life by saying that the man who regards his own life and that of his fellow creatures as meaningless is not merely unfortunate but almost disqualified for life.

INFELD, LEOPOLD. *Albert Einstein: His Work and Its Influence On Our World.* New York: Charles Scribner's Sons, 1950. 132 p. $2.00.

This is another title in Scribner's *Twentieth Century Library.* Despite the universal acceptance of Einstein as possibly the leading thinker of the first half of the twentieth century, there are relatively few people who feel confident of their capacity to understand the real nature of his discoveries or to follow the revolutionary steps of his thinking. (Many people will feel this is even more so after Einstein's recent announcement of his Gravity—Electromagnetism Theory—not discussed in this book.)

Dr. Infeld believes this feeling is not justified. He believes that the intelligent reader, regardless of his lack of special scientific or mathematical training, can be given considerable insight into the basic ideas of modern theoretical physics and their origins. "Sometime in the future," he says, "the principles of relativity may even be taught in high school. The underlying ideas are both simple and essential, although the process of translating results into ordinary language requires time! In this book Dr. Infeld does a good job of translating, but the work is not too easy to understand. Yet Einstein's work was the foundation stone for the Atomic Age recently ushered in. It is quite probable as many people now believe, that in a century or even half a century from now, that the world of that day will wonder how anyone else could have been considered as the greatest man of the twentieth century.

LEVINGER, ELMA EHRLICH. *Albert Einstein.* New York: Julian Messner, Inc., 1949. 174 p. $2.75.

This is a charming biography of the world's greatest scientist. As in most cases great persons seem only average folks except in the particular area of their specialization. And so the author demonstrates this truth in the life of Einstein. She has made the formulator of the difficult to understand (for most people) theory of relativity a most human, lovable character. Like most of the rest of us, he has had his share (even more than his share) of difficulties, trials and tribulations, so much so one may wonder how he really lived through them all.

Hitler burned his essays, offered $5,000 to anyone who would assassinate him, confiscated his lovely home and bank account, and made him flee for his very life to a foreign shore from a country he loved so well.

The writer writes so well and so feelingly that the reader seems to share personally in Einstein's schooling, everyday activities, his scientific achievements, his trials and tribulations, as well as in his moments of joy and happiness.

This is an excellent book for anyone to read, especially high school boys and girls. It is an excellent book for the high school science library.

STIMSON, DOROTHY. *Scientists and Amateurs.* New York: Henry Schuman, Inc., Publishers, 1949. 270 p. $4.00.

Chartered in 1662, the Royal Society will soon celebrate its three hundredth anniversary. It is the world's oldest scientific body in continuous existence. Its importance to science, to technology, to exploration, to international understanding can hardly be exaggerated. To be a member of the Royal Society is one of the greatest distinctions that can come to any man of science. Its members include many of the great names of science—e.g., Boyle, Newton, Halley, and Hooke in the 17th Century.

This is a book for the general reader, the stimulating, challenging, interesting history of the Royal Society. Miss Stimson is Chairman of the History Department at Goucher College and was for many years Dean of the College.

Scientists and Amateurs is one of *The Life of Science Library* books dealing with great men in science and technology.

OEHSER, PAUL H. *Sons of Science.* New York: Henry Schuman, Inc., Publishers, 1949. 220 p. $4.00.

This is the amazing life-history of the famous Smithsonian Institution. Few stranger stories exist in the annals of human culture than the origin of the Smithsonian Institution. It was made possible by the amazing bequest of a bachelor English chemist, James Smithson—a gift of

slightly over half a million dollars. No one has been able to explain Smithson's motive in making such a bequest—and then only by mere chance was the bequested money made available for Congressional action. After ten years more or less of debate Congress passed the Smithsonian bill introduced in Congress by the well known Robert Dale Owen of New Harmony, Indiana, fame.

The Smithsonian has been very fortunate in its selection of men who have, as Secretary, directed the affairs of the Institution. First there was Joseph Henry, the great physicist; then Spencer Fullerton Baird, biologist; George Brown Goode, museum expert; Samuel Pierpont Langley, astronomer and a pioneer in "flying-machines"; Charles Walcott, geologist; Charles Greeley Abbot, physicist and astronomer; and now Alexander Wetmore, ornithologist.

This is a fine book for the general reader, whether his chief interest is science, biography, or history.

FARRINGTON, BENJAMIN. *Francis Bacon: Philosophy of Industrial Science.* New York: Henry Schuman, Inc., Publishers, 1949. 202 p. $3.50.

One of the first men in all history to grasp the revolutionary possibilities of man's increasing control over natural forces, Francis Bacon in 1620 was the first to set forth these views: We have squandered our treasure through a combination of technical efficiency and political incompetency. Today, little more than three hundred years after Bacon sounded his warning note, man is coming within a measurable distance of exhausting many of the resources of this planet. Bacon's plan for the total reform of society by the application of science to production was the central theme of his life and is the central theme of this new study of his career.

This is a title in *The Life of Science Library.*

MAGNUS, RUDOLF. *Goethe as a Scientist.* New York: Henry Schuman, Inc., Publishers, 1949. 259 p. $3.50.

This is another of the series of books in *The Life of Science Library.* The superb achievements of Goethe as a poet are so much better known than his creative work in science. Like Leonardo, the painter, he was a scientist of historic stature, his rich mind ranging many fields. Goethe's contributions ranged from studies in botany, osteology, comparative anatomy, and color theories to mineralogy, geology, and meteorology.

TAYLOR, F. SHERWOOD. *The Alchemists: Founders of Modern Chemistry.* New York: Henry Schuman, Inc., Publishers, 1949. 246 p. $4.00.

Alchemy has been called the history of an error. It was "at once a craft and a creed, a quest for riches and a work of piety, a laboratory research and a mystical system." It was the fruitless search for the secret of transmitting base metals into gold and silver which began the long tradition of laboratory technique, and culminated in the triumphs of modern science.

Alchemy is distinguished from chemistry first by its purpose and second by its method. Alchemy had its origins in Egypt and in Alexandria more than eighteen hundred years ago and it later dominated the scientific thinking and research of the Middle Ages. Alchemy in its hopeless pursuit of the practical transmutation of metals was responsible for almost the whole development of chemical technique before the middle of the seventeenth century, and led to the discovery of many important materials. The ostensible object of the alchemists was to transmute other metals into gold. The factor common to alchemy and chemistry is that of technique.

In general, alchemical writings have remained deeply obscure. The picturesque symbolism of lion and dragon, toad and serpent, has received no convincing interpretation. This treatise draws upon the whole body of alchemical writings, including many unpublished manuscripts. There is a chapter on Chinese alchemy. The author is probably the world's foremost authority on alchemy. His doctoral thesis twenty-five years ago and his subsequent research, was and has been in the history and interpretation of alchemy. He is Curator of the Museum of the History of Science, Oxford University.

HATCHER, WILLIAM H. *An Introduction to Chemical Science.* New York: John Wiley and Sons, Inc., 1949. 449 p. $4.00.

This is the second edition of an elementary college textbook intended for use in a complete non-specialist course for liberal arts students. Much more emphasis is placed on organic chemistry and industrial chemistry than is found in the usual first year college chemistry text. In fact, about half of the textual material is devoted to these two topics.

SEARS, PAUL B. *Charles Darwin: The Naturalist as a Cultural Force.* New York: Charles Scribner's Sons, 1950. 124 p. $2.00.

This is one of the Scribner's *Twentieth Century Library* books. The purpose of this series of books is to give the intelligent layman a basic understanding of those thinkers of the last hundred years who have most influenced the intellectual currents of our time. In addition to presenting an exposition of the man's thoughts, each volume of the series deals with the origins of his thought in the history of ideas and with its ramifications in the contemporary world. The books are written by authors who are recognized authorities in their fields and who are able to discuss difficult and important ideas with clarity and without superficiality. These are not books for the specialists. They are written to open new doors of understanding to the intellectually curious—in whatever field.

Charles Darwin has profoundly influenced the thinking of our times. Darwin's ideas and example as a scientist had not only a profound influence on fields of knowledge and experience which were in existence during his day but also on those which have opened up since, in no small measure

as a consequence of his work. Darwin did not originate the idea of organic evolution but was the first to amass overwhelming evidence in support of it and, with Alfred Russell Wallace, to present convincing arguments for natural selection.

This as an unusually challenging book to read. It is an excellent synthesis of the many threads that have led us to our present concepts and ideas in the realm of the biological sciences. Clearly shown also is how the developments have overflowed into and colored the thinking in practically all other areas of life. This is a highly recommended book for the student in general college biology courses, for science teachers, and for all persons curious about the development of significant ideas held in the biological and other sciences.

GERARD, RALPH W. *Unresting Cells.* New York: Harper and Brothers, 1949. 439 p. $4.00.

This is a reissue of a notable work first published in 1940. Through popular demand this important authoritative, easy-to-read book has again been made available.

Unresting Cells presents the basic characteristics of living things, including speculation on the origin of life: the nature of protoplasm, enzymes, energy, metabolism, growth and reproduction, differentiation, heredity, and related topics. There are numerous and excellent illustrations by Elizabeth Buchsbaum. The author is a well known physiologist who has taught physiology at the University of Chicago since 1928.

This is an excellent book for certain college courses in biology, physiology, and biological science survey as well as for teachers of elementary science, general science, and high school biology, and laymen interested in a most excellent account of cell growth and characteristics.

BUCHSBAUM, RALPH. *Animals Without Backbones.* Chicago: University of Chicago Press, 1948. 405 p. $6.50.

Animals Without Backbones has been a popular book ever since its first appearance in 1938. It is written for the layman, but serves excellently as a reference for biological science survey courses, for college and secondary biology students, as well as secondary biology, general science, and elementary science teachers. It is highly recommended for the high school science library. Basically the new edition is similar to the old. There are 550 gravure illustrations (150 of them new) and 327 drawings. Altogether this is probably the finest book on invertebrates available to the layman. The book is attractive and most interesting to read.

DUNCAN, WINIFRED. *Webs In the Wind.* New York: The Ronald Press, 1949. 387 p. $4.50.

This is one of the most readable and complete treatises that has been written about spiders and their activities. Based on the author's own observations and illustrated with seventy-four plates also made by the author, the work is more than a scientific report. It is much more readable and interesting than the usual textbook found in these areas. Elementary and secondary science teachers will find it both interesting reading and a fine reference. The last chapter summarizes many interesting things about spiders.

MACGINITIE, G. E., AND MACGINITIE, NETTIE. *Natural History of Marine Animals.* New York: McGraw-Hill Book Company, 1949. 373 p. $6.00.

This book is intended to give the student a general understanding of the ocean as an environment and of the natural history phenomena of the animals that live there. It aims to be practical, simple, yet thoroughly scientific.

PAULI, WOLFGANG F. *The World of Life: A General Biology.* Boston: Houghton Mifflin Company, 1949. 653 p. $5.00.

This is a comprehensive college textbook that in appearance, pictures, and general format resembles a secondary textbook in biology. Much of this resemblance is due to the 524 striking illustrations. The style is vital, interesting, and should appeal to the student. Examples have been selected for interest as well as usefulness.

FULLER, HARRY J., AND TIPPO, OSWALD. *College Botany.* New York: Henry Holt and Company, 1949. 993 p. $5.75.

This text is designed to serve students in general education as well as those majoring in botany. The authors use the newer system in plant classification: Thallophyta, Embryophyta, and Tracheophyta.

EMERSON, FRED W., AND SHIELDS, LORA MANGUM. *Laboratory and Field Exercises in Botany.* Philadelphia: The Blakiston Company, 1949. 303 p. $2.50.

The emphasis is on the living organism but the preserved specimen and prepared slide are used whenever necessary. Training is given in the scientific method of evaluating data. Any standard text may be used with the manual.

THORNE, D. W., AND PETERSON, H. B. *Irrigated Soils.* Philadelphia: The Blakiston Company, 1949. 288 p. $5.00.

This is said to be the first book to be written on soil management and the first text to be written in many years on the agricultural phases of irrigation. As such it would seem to be most timely and in fact such a text is long overdue. The authors are outstanding authorities in the field and this well-written text should prove interesting and challenging to its users.

CHAPMAN, SEVILLE. *How To Study Physics.* Stanford University, California: Stanford University Press, 1946. 28 p.

This pamphlet is distributed by the Addison-Wesley Press of Cambridge, Massachusetts.

The author has tried to be very specific in his remarks, but many of the suggestions are applicable to other fields of study. The first chapter discusses *Why Go To College?*, the

second *Why Study Physics?* This chapter is discussed from the standpoint of the pre-medical student, the engineer, the general student, and the physicist. Then follow chapters on General Study Suggestions, How To Make Notes, How to Work Problems, Mathematics in Physics, The Laboratory, Studying for Examinations, Taking Examinations, Summary, and Conclusion. High School science teachers and students will find much useful practical advice in this pamphlet which easily may be read in an hour's time.

FREEMAN, IRA M. *Modern Introductory Physics.* New York: McGraw-Hill Book Company. 491 p. $4.50.

Modern Introductory Physics is a different college textbook in physics. Not only does the author claim that it is but an examination shows that he has really departed widely from the usual treatment. The treatment is a rather thorough treatment of certain selected topics rather than coverage of all the "usual topics." It attempts to be penetrating but not needlessly detailed, to be meaningful without being technical. More attention than usual is given to the historical and philosophical aspects of physics.

Supplementary reading is emphasized.

SUFFERN, MAURICE GRAYLE. *Basic Electrical Principles.* New York: McGraw-Hill Book Company, Inc., 1949. 430 p. $3.20.

This is a textbook intended to give electrical trades students training in the fundamentals on a vocational educational level. No previous knowledge of electricity or related subjects is assumed. It presents basic principles of electricity as simply as possible.

HART, IVOR B. *James Watt and the History of Steam Power.* New York: Henry Schuman, Inc., Publisher, 1949. 250 p. $4.00.

Steam was the first great power of motivation. In perfecting the steam engine James Watt created the factory. And the factory marked the beginnings of the Industrial Revolution. Mass production followed the hand crafts. So Watt's steam engine brought with it a revolution in engineering in transportation and commercial life.

The author reviews the work of other pioneers whose hypotheses and inventions laid the groundwork for Watt's dramatic success.

James Watt and the History of Steam Power is an interesting and well told story. It will serve as an excellent background source of information for the general science or high school physics teacher. It is recommended as a supplementary reader for students studying high school physics or college students in physical science survey courses.

GATES, FRANK C. *Field Manual of Plant Ecology.* New York: McGraw-Hill Book Company, 1949. 137 p. $3.00.

Based on the author's course in plant ecology taught the past thirty-two summers at the University of Michigan Biological Station, special effort has been made to use as little and as simple apparatus as possible. Techniques employed should be applicable to similar field studies in other localities.

CHAPANIS, ALPHONSE; GARNER, WENDELL R., AND MORGAN, CLIFFORD T. *Applied Experimental Psychology.* New York: John Wiley and Sons, Inc., 1949. 434 p. $4.50.

Applied Experimental Psychology tells what experimental psychologists have learned about how men see, hear, and make movements. It then shows how this information can be applied to build better machines for human use. The book discusses many experiments which have contradictory and inclusive results. In each discussion the authors state what they think is the best answer to each problem. The authors are instructors in the Department of Psychology at the Johns Hopkins University.

HEBB, D. O. *The Organization of Behavior: A Neuropsychological Theory.* New York: John Wiley and Sons, Inc., 1949. 335 p. $4.00.

The author started his work originally in an attempt to understand the peculiar lack of effect which many brain operations had on intelligence and behavior. To account for this lack of effect (as well as for the great effects from apparently similar operations) he developed a hypothesis about learning, perception, and attention. Later he applied this hypothesis to problems of motivation, and mental illness. Thus it led directly to a comprehensive theory of behavior. This book attempts to explain what goes on in the human brain between the arrival of an excitation at a sensory projection area and its departure from the motor area of the cortex.

Dr. Hebb's theory is "a form of connectionism, one of the switchboard variety, though it does not deal in direct connections between afferent and efferent pathways: Not an 'S–R' psychology. It does not make any single nerve cell or pathway essential to any habit or perception."

Regarding mental illness the author states: (1) that there is no separate psychological factors alone—by what was seen and heard in childhood; (2) that we know little about "mental hygiene" or how to achieve it; (3) that it has not been shown that worry or the like can by itself cause any bodily condition such as asthma or stomach ulcers, though it aggravates such conditions; and (4) that it has not been shown that any specialized psychotherapy, such as psychoanalysis, has any special value in mental illness.

"Prediction of the adult IQ, in infancy, is more accurate on the basis of the parent's IQ than that of the infant himself; from an IQ at twelve is about 20 per cent better than chance prediction, very little better than can be done from knowing what kind of a home the child is growing up in."

"There are two determinants of intellectual growth: a completely necessary innate potential and a completely necessary stimulating environment . . . hypothetically we might suppose that intelligence will rise to the level set by heredity

or environment, whichever is lower. Given a perfect environment, the inherited constitution will set the pace; given the heredity of a genius, the environment will do so."

KEITH, SIR ARTHUR. *A New Theory of Human Evolution.* New York: Philosophical Library, 1949. 450 p. $4.75.

It was formerly held by some scientists that man was actually descended from apes of the existing species, the European perhaps from the chimpanzee, the Negro from the gorilla, and the Mongol from the orang-outang. Of late years, however, it has come to be the general opinion among anthropologists that man is not descended from any existing anthropoid but from some now extinct relative; and the fact that all races of mankind will readily interbreed has been taken to show that the human species is really one and must therefore be the offspring, if not of one pair, at least of one related group.

Ever since man's kinship with the apes was recognized, there has been controversy over the nature and habitat of his pre-human ancestors and the causes which led to their development into homo sapiens.

Sir Arthur Keith completed *A New Theory of Human Evolution* on his eighty-first birthday, a theory based on a lifetime of research along this line. He calls it a *Group Theory*—"the machinery of human evolution." Briefly his basal idea is that, from the very beginning, man has evolved as a member of a social team or group; that these miniature societies remained apart and were in competition with each other.

Only time and research will refute or affirm the correctness of the viewpoints developed in this treatise. Should his theory be affirmed Keith will deserve a rank along with Darwin. At any rate the book is challenging, interesting.

CANNON, DOROTHY F. *Explorer of the Human Brain: The Life of Santiago Ramon y Cajal.* New York: Henry Schuman, Inc., Publishers, 1949. 303 p. $4.00.

Santiago Ramon y Cajal (1852–1934) has been called Spain's greatest scientist and one of leading scientific figures in the world. Cajal as a boy was a sort of Peck's Bad Boy—a mischievous, fun-loving problem boy, the torment of his parents and teachers. He became a conscientious student and laboratory worker. But in the midst of his studies he rushed off to Cuba to fight for his country and nearly lost his life. Upon returning home, he married after a whirlwind courtship, on twenty-five dollars a month.

At length he emerged as one of the world's leading original investigators. He corrected many false views held up to his own time as to the minute structure of the nervous system and the human brain. He became a doctor much against his will, but once having made the decision, he put his complete effort and soul into the work at hand. Much that we know today about the nervous system and the human brain is based on the brilliant, original researches of Cajal. His life and achievements loom large in the history of neurology. He was the first histologist to win the Nobel Prize. Dr. Cannon, Medical Editor for J. B. Lippincott Company, has made a real contribution to the history of science by giving us this most interesting to read biography.

WRIGHT, HELEN. *Sweeper in the Sky.* New York: The Macmillan Company, 1949. 253 p. $4.00.

Sweeper in the Sky is the life story of Maria Mitchell (1818–1889), the first woman astronomer in America. She was Director of the Vassar College Observatory from its founding in 1865 until 1888. In 1847 while still in her twenties Maria Mitchell discovered a comet (named Maria Mitchell Comet) in advance of the great scientists in Europe and thereafter became internationally famous. She was an ardent leader in the woman's rights movement and was President of the Association for the Advancement of Women.

Maria Mitchell was born and brought up on the island of Nantucket off the coast of Massachusetts. One of a family of ten children, her Quaker childhood and background ever characterized her philosophy and actions in life. The emphasis upon simplicity and the stern regard for truth and conduct were at once both her asset and in a way her hindrance. She became independent (to an unusual degree for a girl of her times) and self-reliant. She was frank and outspoken, with a strong sense of humor. All of these qualities gave her a marked individuality and made her a unique figure, especially evident as a member of the Vassar College faculty. Her father, a constant companion and guide throughout his life, had a very great influence upon the great woman astronomer and mathematician.

The book is most interesting and realistically portrayed. Yet to the reviewer the fine print puts a handicap on the reader that so excellent a story does not deserve. It is an excellent book for the laymen as well as high school boys and girls interested in science. It is a good book for "career" reading, too.

BALDWIN, RALPH B. *The Face of the Moon.* Chicago: The University of Chicago Press, 1949. 239 p. $5.00.

Astronomers, geologists, science teachers, and scientifically inclined laymen will find this book an indispensable addition to their libraries. Undoubtedly this is the most authoritative book that has been published about the moon. Practically all reference to legends and myths about the moon are omitted. Rather the author is concerned with the nature and the origin of the myriads of craters and other surface features found on the moon.

The author examines and rejects all but one of the processes previously suggested to account for the lunar craters, rays, mountain ranges, and

lava flows. He selects and clearly demonstrates as the most probable cause the impacts of giant meteorites on the rocky lunar face and their resultant explosions. The energies released from millions of such collisions throughout the lifetime of the moon have blasted its rocky surface into the present tortured wasteland. The large sizes of many of the moon's craters is primarily or wholly due to the explosiveness of the meteoritic impact, for the meteorites themselves were relatively small. For example it is believed that the meteorite of Coon Butte, Arizona, was probably between 30 and 500 feet, although it blasted out a crater more than 4,000 feet in diameter.

The various meteorite craters on the earth are discussed in some detail. Then the author raises the questions as to why no evidence of meteorite caters in the earlier rock formations of the earth's crust. The author suggests we do have such formations on earth, and lists several of these, and proposes that the peculiar characteristics of these formations can best be explained by assuming impact of meteorites.

Neither the origin of the earth or moon is known, but whatever it was they probably had a common one. Baldwin does not believe that the moon was ever a part of the earth, but that both moon and earth as well as other planets have been subjected to terrific meteorite bombardments, especially in earlier parts of their existence. While all astronomers and geologists may not accede to all of Baldwin's thesis, he seems to have assembled almost indisputable evidence for a meteorite origin of the moon's crater. Altogether here is a scientific publication of the greatest significance, quite readable for most laymen.

CASE, EARL C. *College Geography.* New York: John Wiley and Sons, Inc., 1949. 790 p. $5.00.

This is the third edition of the Case-Bergsmark *College Geography.* Since the previous revision was in 1940 this revision brings the subject matter, charts, and graphs up-to-date. Some phases have been given less weight while other phases now seem more important. There is a greater emphasis upon principles, physiographic diagrams, and place and distribution maps. This is an economic and regional geography of the world.

EMMONS, WILLIAM H., THIEL, GEORGE A., STAUFFER, CLINTON R., AND ALLISON, IRA S. *Geology: Principles and Processes.* New York: McGraw-Hill Book Company, 1949. 502 p. $4.50.

This is the third edition of a text first published in 1932. More emphasis has been placed on the interpretation of landscape and geologic structure as seen from the air, and less emphasis on the technical aspects of metamorphism and vulcanism. The treatment is technical but in a literary style that should be challenging to students using the text. There are nearly five hundred illustrations and photographs. These seem to be most effective and well selected. Students using the book should obtain an excellent basic foundation in the fundamental concepts of physical geology.

MOORE, RAYMOND C. *Introduction to Historical Geology.* New York: McGraw-Hill Book Company, 1949. 582 p. $5.00.

Introduction to Historical Geology is intended both for students who have only a cultural interest in geology and those expecting to pursue training for professional work in geology. As a result of this stated purpose the author emphasizes cause-to-effect relations and principles. Illustrations are numerous and largely new. Students and lay readers such as general science teachers should find little difficulty in reading the text.

DUNBAR, CARL O. *Historical Geology.* New York: John Wiley and Sons, Inc., 1949. 567 p. $5.00.

This volume is a successor to and an outgrowth of the *Textbook of Historical Geology* by Schuchert and Dunbar (1933, 1941) and to the still earlier book by Pirsson and Schuchert first published in 1915. Through the years this series has probably been America's most widely used historical geology. This popularity has been well deserved. It will probably continue with this revised edition. It has unusual reader interest and appeal. The illustrations in this revised text are unusually good. About one-third of them are new. Color slides are available for use with the text.

REDDICK, HARRY W. *Differential Equations.* New York: John Wiley and Sons, Inc., 1949. 288 p. $3.00.

This is a clear discussion of the solution and practical applications of ordinary differential equations.

WEISS, MARIE J. *Higher Algebra for the Undergraduate.* New York: John Wiley and Sons, Inc., 1949. 165 p. $3.75.

This is a text designed for a six-semester hour course for a student who has had two years of college mathematics including calculus.

LEE, OLIVER JUSTIN. *Measuring Our Universe.* New York: The Ronald Press Company, 1950. 170 p. $3.00.

Measuring Our Universe explains how scientists measure distances from the infinitely small to the infinitely great. It is the story of how our familiar units of length grew out of the practical experience of men for thousands of years and how the development of the sciences made it necessary to define and standardize these units and to invent new ones. This is an unusually fine book for the layman—challenging, awe-inspiring. "Distances, when known, are like keys which unlock many of the doors of the universe." Distances and space are so incomprehensible! Who can really visualize a half-mile, a square

mile, or a cubic mile, without filling these in with familiar objects—houses, trees, streams, and so on? And yet our ideas of distances—small and great, entirely change our conception of the universe, of time, and our own relation to and purpose in the universe.

The most accurately measured long distance is the 22 miles distance between two points—Mount San Antonio and Mount Wilson in California—the base line for Michelson's determination of the velocity of light. The probable error is no greater than one part in 6,800,000 or about two-tenths of an inch in the 22 miles. The commonly accepted distance to the sun, based on more recent, widespread measurements based on Eros, is 93,004,000 miles. The text describes the various methods of determining the distances to remote stars, their sizes, and movements.

In regard to the findings of science "The layman has three choices. He may establish his confidence in the conclusions of scientists by learning to understand their techniques and reasoning; he may simply accept their findings just as he accepts the diagnosis of a physician or any other expert; or he may combine the two in whatever proportion best suits his tastes or convenience."

HEADQUARTERS STAFF OF THE AMERICAN RADIO RELAY LEAGUE. *The Radio Amateur's Handbook.* West Hartford, Connecticut: The American Radio Relay League, 1950. 736 p. $2.00.

This is the twenty-seventh edition of the world's best, most authoritative radio book. All material has been carefully revised and brought thoroughly up to date. Seemingly about everything is included: history, fundamentals, construction, new devices and gadgets, and so on. There are 1165 diagrams and a ten page topical index.

GRIBBLE, LLOYD RAYMOND. *Comparative Anatomy Laboratory Manual.* Philadelphia: The Blakiston Company, 1950. 232 p. $3.00.

Comparative Anatomy Laboratory Manual is designed to serve as a guide in the dissection and comparative studies of the systems of a number of representative animals. There are 41 plates.

SYMPOSIUM. *Time and Its Mysteries, Series III.* New York: New York University Press, 1949. 126 p. $3.00.

Time and Its Mysteries consists of four lectures given on the James Arthur Foundation of New York University. The lectures were as follows: *The Time Scale of the Universe* by Henry Norris Russell; The *Geological Records of Time* by Adolph Knopf; *Time and Historical Perspective* by James T. Shotwell; and *Developments in Portable Timepieces* by George P. Luckey.

Time scales for the age of the earth and members of the universe are based on disintegration of uranium into lead and helium, galactic motions, and radiation of the stars.

Geology as a science began about 1785 with the publication of James Hutton's *Theory of the Earth.* In the past the earth has been assigned various ages by different scientists, the varying lengths depending upon the method used. Lead from uranium deposits gives an age now more or less accepted by scientist—something more than two and a half billion years. The date when the calendar years of 365 days was inaugurated in Egypt has been fixed by Dr. James Breasted at 4236 B.C.

HARDIN, GARRETT. *Biology: Its Human Implications.* San Francisco: W. H. Freeman and Company, 1949. 635 p.

This is a textbook intended for a survey course in biology, for those college students who will never pursue formal instruction in biology. Emphasis is made in three categories: (1) Generalizations that should be part of the intellectual equipment of every well-educated man and woman; (2) Details: (a) the minimum technical details needed for a firm foundation of the great generalizations and (b) those details that have a fairly immediate bearing on human welfare and human problems; and (3) Method, particularly scientific method that has revolutionized the life of mankind.

The five parts to the book are: (1) Introduction to the Science of Biology, (2) The Measure of Man, (3) The Variety of Living Things, (4) The Unity of Living Things, and (5) The Web of Life. Altogether this text seems to be an excellent book for the biology survey course, probably one of the best yet published.

FORBES, R. J. *Man the Maker.* New York: Henry Schuman, Inc., 1950. 355 p. $4.00.

Man the Maker is a history of technology and engineering. The story of man's development as a tool-using animal from paleolithic man to the present day is a fascinating one. The book discusses the discoveries and inventions of prehistory as well as those of the Ancient East, the Greeks, Romans, Arabs, the Middle East, down to the present time.

As the story unfolds one is impressed with the fact that progress in science and technology has not been confined to any particular nation or people but is the accumulated heritage of the past, the combined experiments and strivings of hundreds of generations in all parts of the world. There are 41 photographs as well as numerous illustrations.

Altogether this is an excellent book that should be of much interest to both the science and the history teacher. It would be an excellent book for the high school library.

MACGOWAN, KENNETH. *Early Man in the New World.* New York: The Macmillan Company, 1950. 260 p. $5.00.

This is an unusually fine book, interestingly and challengingly written. The question, "How old is man in America?" has long been a subject of

investigation by American anthropologists. Man's coming to the Americas once assumed to have been not too long before Columbus has been pushed back and back until today it is believed man was here at least 14,000 years before Columbus. Some believe it may have been as much as 25,000 years ago, dating from late glacial times. Was the first American merely another sort of Indian or is there resemblance to the Australoid and the Negroid in his skulls and cultures? Bringing together and interpreting all the pertinent facts and theories is a kind of anthropological "detective story." This is what the author has done in a most readable book. Early American man cultivated many plants entirely peculiar to the New World: corn, white potato, sweet potato, tomato, pumpkin, squash, peanut, lima bean, kidney bean, pineapple, cacao for chocolate, chili pepper, strawberry, manioc, avocado, Jerusalem artichoke, tobacco, cinchona, rubber, chicle, persimmon, papaw, guava, cashew nut, and so on.

There are many illustrations that add much to the understanding and charm of the book. Altogether it is one of the finest books about early American history that has been published. It is a fine book for anyone to read and is especially recommended for the high school library.

KORN, TERRY AND ELIZABETH M. *Trailblazer to Television.* New York: Charles Scribner's Sons, 1950. 144 p. $2.50.

Trailblazer to Television is the story of Dr. Arthur Korn, the scientist who transmitted the first picture by wireless across the Atlantic—an important step on the road to television. His invention was known as phototelegraphy in Europe, facsimile in America. He pioneered the first practical news picture systems connecting many large cities in France, England, Italy, and Germany.

Born, reared, and educated in Germany, he worked and studied with many of the great scientists in Germany and Italy.

The authors are Elizabeth, the wife of Dr. Korn and Terry, the inventor's daughter-in-law. The latter did the actual writing. Elizabeth who teaches art in Drew University did the illustrations. Dr. Korn died in 1945. The Korns came to America to live after World War I. They had been thrilled by amazing America on an earlier visit and trip across the country.

This is an interesting book for the science book shelf and as reading for the high school science student.

HANNA, PAUL R. AND KOHN, CLYDE F. *Cross-Country.* Chicago: Scott, Foresman and Company, 1950. 160 p. $2.20.

Cross-Country is the fourth-grade book of the Social Studies Series. The vocabulary is of third grade level. There are 28 maps, four in full color and 142 illustrations, many in color. There are seven units: Home in Los Angeles, California; Across the Desert; Through the Mountains; Across the Plains; Up from the River; Down to the Ocean; and Home in Washington, D.C.

The teaching approach is made through a cross-country tour by the Page family, Father, Mother, Tom age ten, and Ruth age five. The tour starts in Los Angeles and ends in Washington, D. C. The story is told in narrative, fictional form but the geographic facts are accurate. Kept in control are *concepts, vocabulary, culture, latitude,* and the *season.*

The story, vocabulary, literary form, pictures and illustrations, and concepts presented should make a strong appeal to fourth-grade children.

ANDERSON, RUDOLPH E. *The Story of the American Automobile.* Washington, D. C. (2153 Florida Avenue N.W.): Public Affairs Press, 1950. 301 p. $3.75.

The Story of the American Automobile throws considerable amount of new light on the development of the American automobile. It is illustrated with 150 old prints and photos. Mr. Anderson offers extraordinary evidence that the automobile was thought up and contrived long before the usually ascribed years. He reveals for example that the idea of the automobile can be traced back to ancient mythology and Biblical prophecy.

Readers will enjoy his chapters dealing with the glamorization of the automobile through sex appeal promotion, popular songs, the movies, and, of course, advertising. Woven into this story is the account of the people—Ford, Studebaker, Olds and many others who have made the automobile synonymous with the American way of life.

This is an excellent book for the high school science library.

SMITH, GUY HAROLD (Editor). *Conservation of the Natural Resources.* New York: John Wiley and Sons, Inc., 1950. 552 p. $6.00.

America faces no greater problem than that of conservation of her natural resources. The book begins with a review of the history of conservation in the United States and the disposal of the public domain. After this the authors deal with each resource in turn, emphasizing the following information:

- The basic geographical and conservational facts about each resource—Its extent and distribution.
- The use to which it has been put in regional and national development.
- The natural and human factors which have made themselves felt in this generation.
- The conservation practices which should be followed to achieve security.

The last two sections cover recreational resources and the entire subject of planning an effective conservation program from the stand-

point of the local, state, and federal governments.

Among the list of twenty contributors are: the late Ellsworth Huntington, the late Ralph H. Brown, Stephen S. Visher, Louis O. Wolfonger, J. Russell Smith, George J. Miller, Guy-Harold Smith, and John H. Garland.

BURCHARD, JOHN ELY. *Mid-Century: The Social Implications of Scientific Progress.* New York: John Wiley & Sons, Inc., 1950. 549 p. $7.50.

This is the verbatim account of the discussions held at the Massachusetts Institute of Technology on the occasion of its Mid-Century Convocation, March 31, April 1, and April 2, 1949. The account was edited and annotated by John E. Burchard, Dean of Humanities at the Institute.

Included in the book are the remarks of some forty leading scholars and men of affairs who participated in the Convocation, along with interesting sidelights, panel discussions, and collateral documentation from other speakers, writers and the press.

Current problems involving man and his relation to the world are significantly analyzed by such world-famous personalities who addressed the Convocation as Winston Churchill, Karl T. Compton, Harold Stassen, Vannevar Bush, Percy W. Bridgman, Sidney Hooke, and Nelson A. Rockefeller.

Mid-Century is quite likely to stand as the single best statement of science and its social implications as science enters the second half of the twentieth century.

BATES, MARSTON. *The Nature of Natural History.* New York: Charles Scribner's Sons, 1950. 309 p. $3.50.

The author states that his purpose in writing this book is missionary—to arouse interest in an attitude and to explain a point of view. The author attempts to describe an area of science, natural history, as a sample of the content and method. It is a study in the approach of science to the living world of which we form a part. Science is a search, a certain way of searching. It is the story of the persistent efforts of the human mind to order and understand the facts of natural history in their proper dramatic light.

The book is written in a literary style that is interesting, challenging, never boring. It is an excellent book for laymen and for all science teachers.

WILLIAMS, BERYL, AND EPSTEIN, SAMUEL. *The Great Houdini.* New York: Julian Messner, Inc., 1950. 182 p. $2.75.

Magicians may come and go but the feats of the great Houdini live on. As a magician he had no peers, nor is it likely that any will soon appear. For more than a quarter of a century (1900–1926) he was the world's best known showman.

This is a story of his life, his early poverty and hardship, his early struggles in third rate vaudeville, and his emergence as the world's most expert showman, known all over Europe and America. His career was spectacular and he was the peer of every one in his profession. He was and remains the greatest escape artist of all time. Hard work, nimble fingers, use of every bit of technical, scientific and psychology that would further his reach toward perfection, helped to almost reach that goal. He could walk through a brick wall, make an elephant disappear, and escape himself from the most intricately locked handcuffs, prison cells, bank vaults or fetters ever devised by man. Scotland Yard and federal prisons could not hold him. In his later years he is best known and remembered for his exposé of the fraudulent claims of psychic powers of numerous mediums. He successfully met the challenge and exposed as quacks the claims of every medium who claimed she had psychic powers to speak to the dead, produce ghosts, or foretell the future.

A book about Houdini is always interesting. A few of his tricks are exposed here, but many more still remain a secret.

VELIKOVSKY, IMMANUEL. *Worlds in Collision.* New York: The Macmillan Company, 1950. 401 p. $4.50.

Worlds in Collision is a controversial book and promises to long continue being so. It is and may long be regarded by most scientists as mostly fiction in so far as the scientific theories it advances are concerned. The reviewer enjoyed reading the book but finished reading it unconvinced that any scientist of repute would give it his confirmation.

The author does offer much supporting historical evidence to support his scientific world-upsetting theories. One is reminded of the still controversial Wegnerian theory of floating continents or the lost continent of Atlantis (the latter receives a good deal of attention in this book).

What new and unique theories does the author advance? He claims that the earth's orbit has changed more than once and with it the length of day; that the geographical position of the terrestrial axis and its astronomical direction changed repeatedly and that at a recent date the polar star was in the constellation of the Great Bear. The length of day altered; the polar regions shifted; the polar ice became displaced into modern latitudes, and other regions moved into the polar circles.

The planet Venus is of recent origin. Not so long ago the author maintains it was a comet that had several brushes with the earth and the earth passed through its tail. The earth was

bombarded with meteorites and great hurricanes, tides and fires were caused on earth. Earlier, Venus had been a part of Jupiter.

Mars also had close contacts with the earth and its present orbit is quite different from its former one. These earth collisions with Venus and Mars had their effect on the moon, too, and explain the great lava craters on its surface. The encounters of the earth, Venus, Mars, and comets brought sudden and great changes in terrestrial conditions on the earth. Even the earth at least twice previously rotated from east to west and the sun and moon of Joshua did actually stand still.

A number of other unique ideas are advanced. Certainly they sound fanciful to most leaders of today's scientific thought. Is there any scientific basis to support what the author postulates? The author states that his new theories do not violate any known laws of science and he does offer much supporting historical and unexplainable geological evidence. Indeed this seems to be a mysterious earth upon which we live. Most of the events occurred within historical times and very recently geologically speaking—one about 1500 B.C. and another in 747 B.C.

PATTERSON, AUSTIN M. *A German-English Dictionary for Chemists.* New York: John Wiley & Sons, Inc., 1950. 541 p. $5.00.

Although this book is designed primarily for chemists and chemical engineers, it has proved useful to physicists, biologists, and geologists. It is the first technical dictionary to include a vocabulary of *general* words.

FERNALD, MERRITT LYNDON. *Gray's Manual of Botany.* New York: American Book Company, 1950. 1632 p. $9.50.

Asa Gray has long been recognized as probably America's greatest botanist. His first *Manual of the Botany of the Northern United States* was published in 1848. No other manual has been so widely cited as the top authority in this field. The last and seventh edition appeared in 1908. Hence this new eighth edition will be welcomed by botanists everywhere. Such a revision has been long overdue.

FREEDMAN, PAUL. *The Principles of Scientific Research.* Washington, D. C. (2153 Florida Avenue): Public Affairs Press, 1950. 222 p. $3.25.

The object of this book is to deal with research associated with science. The author defines science in the following terms: "Science is a form of human activity through pursuit of which mankind acquires an increasingly fuller and more accurate knowledge and understanding of nature, past, present and future, and an increasing capacity to adapt itself to and to change its environment and to modify its own characteristics."

The author attempts to describe the kind of life a scientist whose life is to be devoted to research may expect. He discusses the nature of research and its history, research and society, research and philosophy, the mental approach, the planning of research, experimentation, and accuracy and economy of effort.

SIMON, MARON J., PIERCE, DICKSON W., ELLIOTT, JOHN, AND HENDRIX, BEATRICE P. *The Complete Garden Handbook.* New York: D. Van Nostrand Company, Inc., 1950. 451 p. $5.00.

Nearly everything is included in this unusually fine and complete book on gardening. There are chapters on planning and preparing the ground; flowering plants for the home garden; roses; trees, shrubs, and lawns; small orchards for the home; how to work a vegetable garden; how to buy woody plants; garden pests and their controls; flower arrangements; plants for indoors; and garden aids at a glance.

There are 32 color plates as well as numerous illustrations and photographs in black and white.

BUSH, GEORGE P., AND HATTERY, LOWELL H. *Scientific Research: Its Administration and Organization.* Washington, D. C. (2153 Florida Avenue): American University Press, 1950. 190 p. $3.25.

This book is based on the proceedings of the Institute of Scientific Research and Development held at American University. There are papers by Edward U. Condon, Hugh L. Dryden, Raymund Zwemer, Ralph Shaw, C. W. Good, Lawrence W. Bass and many others.

BATEMAN, ALAN M. *Economic Mineral Deposits.* New York: John Wiley and Sons, Inc., 1950. 916 p. $7.50.

Economic Mineral Deposits is quite complete and comprehensive. Principles and processes are presented in part one. Metallic and non-metallic mineral deposits are next discussed. Information regarding present deposits is included.

The book will serve not only as a fine text but also as an unusually good reference book.

STEFFERUD, ALFRED. *How to Know the Wild Flowers.* New York: Henry Holt and Company, 1950. 144 p. $2.00.

This book stresses a working knowledge of the parts of plants, their habitats and habits, and the distinguishing marks of the main families. It begins with the simplest flower forms to the most complex, from trilliums to the complicated sunflowers. It is a general guide to the 400 flowers one is most likely to come across. There are 140 illustrations in black and white. Biology teachers, biology students, and elementary science teachers should find the book useful.

The author is editor of the *Yearbook of Agriculture* published by the United States Department of Agriculture.

MOLDENKE, HAROLD N. *American Wild Flowers.* New York: D. Van Nostrand Company, 1950. 453 p. $6.95.

American Wild Flowers describes America's favorite wild flowers from coast to coast and from Canada to Mexico. It is written simply, clearly, authoritatively. More than 2,000 principal varieties of wild flowers are covered. Fifty chapters, each devoted to a related group of plants, describes the flowers, the areas in which they are found, their seasons, and interesting and significant things about them. The selection of the flowers included is based upon a nation-wide survey of botanists and experts in wild life.

There are 88 photographs in full color and 67 in gravure. The author, Dr. Harold N. Moldenke, is Curator and Administrator of the Herbarium, the New York Botanical Garden.

BRADFORD, S. G. *Documentation.* Washington, D. C. (2153 Florida Avenue): Public Affairs Press, 1950. 156 p. $3.00.

Documentation is intended for use by research workers, social scientists, physical scientists, journalists, bibliographers, publicists, and librarians.

DAVIS, FRANK G., AND NORRIS, PEARLE S. *Guidance Handbook for Teachers.* New York: McGraw-Hill Book Company, 1949. 344 p. $3.50.

Guidance Handbook for Teachers is written from a psychological approach. The problems of teachers are illustrated with numerous examples. Among the twenty-nine units are: the homeroom, the homeroom teacher's cumulative pupil personnel record, the pupil questionnaire, the pupil autobiography, the anecdotal record, the home visit, the seating chart, personality rating, the report to parents, the scattergram, the pupil's plan book, and evaluating the guidance program.

Annotated bibliographies, questions, and problems are included.

ARBUCKLE, DUGALD S. *Teacher Counseling.* Cambridge, Massachusetts: Addison-Wesley Press, Inc., 1950. 178 p.

Teacher Counseling is written for teachers and parents. The author points out traits of the traditional teacher and compares these with the newer concepts of teaching. The book contains numerous verbatim reports of counseling sessions between teachers and students. The older emphasis in teaching was on *teaching of the group* and the newer emphasis is on the *learning of the individual.* Many practical suggestions are given regarding classroom guidance—problems of individual and class behavior, home relationships, pupil relationships, use of tests, etc.

WRIGHT, BARBARA H. *Practical Handbook for Group Guidance.* Chicago: Science Research Associates, 1948. 225 p.

This handbook is intended for teacher-advisers of homerooms, common learnings classes, and clubs. It is hoped that it will give teachers a better understanding of the real concerns of youngsters during adolescence and of some of the ways to understand their behavior and guide them.

There are five major parts to the book as follows: the role of group guidance, the student and his problems, planning with students, guiding the group, and administration of the program.

This book would be very useful to all teachers who have homerooms and perforce must do more or less counseling. Specific helps and rules are suggested for better meeting the needs of boys and girls of the junior and senior high school level.

JERSILD, ARTHUR T., AND TASCH, RUTH J. *Children's Interests and What They Suggest for Education.* New York: Bureau of Publications, Teachers College, Columbia University, 1949. 173 p. $3.25.

This study was carried on by the authors in collaboration with committees of teachers of the public schools of Springfield, Missouri. It is a survey of the wishes, interests, likes and dislikes which children express.

Pupils in grades 1–12 took part in the study. Large-city, small-city, suburban, small-town, colored, white, public, and private schools located in the Middle West, in the South, and around New York City are represented in the 2248 children study. The study is a post-war study.

The findings in many phases of this study emphasize the fact that children at all age levels are much preoccupied with people and personal relations. "There is a strong element of self-interest and self-reference in children's ideas about life and the world at large. Children attach great importance to gifts, especially at the younger levels. The findings show much variation between interest of children in different schools and in different classes, notably in connection with the arts and crafts. Many lines of evidence in this study are in keeping with findings that have emerged from earlier studies which indicate that children's interests to a great degree are learned. What a child likes to do is influenced by what he has an opportunity to learn to like to do, provided, of course, that he not only has the opportunity but also the ability to make use of it. There is a decline with age in educational morale in practically all communities included in the study.

There is an impressive increase with age in interest in various forms of self-improvement, vocational fitness or placement, educational opportunity, and understanding of self and others. Social studies as compared with other studies are relatively unpopular. Art and crafts seem to be best liked. Failure to acquire an interest in childhood may leave a lifelong gap.

Detailed findings of various phases of the study are found in the appendix. The study reveals some major shortcomings of present educational programs. Of special significance for educational planners are the conclusions regarding the school program and the description of how children's educational morale declines with age.

BEERY, MARY. *Manners Made Easy.* New York: McGraw-Hill Book Company, 1949. 327 p.

This is an excellent book for any high school boy or girl, for the homeroom teacher, the student adviser, the "common-learnings" course, and the high school library. It will meet many of the urgent needs of youth. There are self-rating charts, specific suggestions and hints, pertinent photographs, and suggested reading matter.

Content is as follows: social poise—its up to you; manners at home—of first importance; behavior at school—you're one of many; posture and health—they both affect poise; cleanliness—can you pass the test?; grooming—the key to attractiveness; your clothes—let them be fitting; conversation—it does matter how you say it; in public—conventions are important; social affairs—but everything doesn't go; dates and dances—the highlights of youth; at the table—enjoy your food, but; dining out—an art if done right; social correspondence—your letters reflect you; traveling—and still custom rules.

The reviewer unhesitatingly rates this book as one of the finest possible additions to the high school library.

BROADLEY, CHARLES V., AND BROADLEY, MARGARET E. *Know Your Real Abilities.* New York: McGraw-Hill Book Company, 1948. 209 p. $2.75.

Know Your Real Abilities is the product of 25 years of research work in Mr. Johnson O'Connor's Human Engineering Laboratory where over 30,000 persons are tested yearly. It is a most interesting book to read. It is composed almost entirely of personal histories told in narrative style. Examples are given of how self-knowledge tests may be used to make a better adjustment to one's work.

There is a descriptive list of the known aptitudes. A rather extensive chart showing various combinations of aptitudes and their vocational significance is given. Chapters are devoted to a number of vocations in which are described a number of case histories of success and failure. These include: the executive, the salesman, the office worker, the engineer, factory worker, the banker, lawyer, artist, writer, doctor, business man, entertainer, and teacher. Other chapter headings are on developing human assets, changing our work, vocabulary and success, aptitudes and alcoholism, and philosophy of the laboratory.

This is an excellent book for the high school reference library.

SCHERF, C. H. *Do Your Own Thinking.* New York: McGraw-Hill Book Company, 1948. 368 p. $2.40.

The purpose of this book is to encourage the student to think for himself. It is concerned primarily with the development in the student of a healthy mind achieved through sound, objective thinking. The relation of straight thinking to study, vocabulary, personality, creativeness, ethical conduct, and other subjects, is considered in terms of the student's everyday experiences.

The book stresses the following objectives: mental health, control, and proper use of the emotions, encouragement of the creative spirit, how to study, vocabulary growth, personality improvement, building of a personal code of ethics, avoiding "scrapes," and straight thinking. Real case studies are used as examples. Thought-

provoking questions and discussion problems are found at the end of each chapter.

This is an excellent book for high school boys and girls, for college freshmen orientation courses, and for use by student guidance advisers. This is an excellent book for the high school reference library.

LEE, J. MURRAY, AND LEE, DORRIS MAY. *The Child and His Curriculum.* New York: Appleton-Century-Crofts, Inc., 1950. 710 p. $4.50.

This book was written for the teacher who is interested in the child of elementary-school age and in the curriculum best suited to that child. Part I discusses understanding the elementary-school child: wider goals, the child as a growing organism, the child and his developing emotions, the child as motivated by purposes and interests, and the child as a learner. Part II discusses experiences as the curriculum; the curriculum, the unit of work, resources for learning, the study of man, learning to use language, developing quantitative thinking, developing scientific concepts, providing healthful living, providing opportunity for creative expression, and evaluative changes in the child.

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ARTICLES

AUTHORS